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Improving Air Force Enterprise Resource Planning-Enabled Business Transformation

Jessie Riposo, Guy Weichenberg, Chelsea Kaihoi Duran, Bernard Fox, William Shelton, Andreas Thorsen

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RAND Project AIR FORCE

Prepared for the United States Air Force
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Preface

Enterprise Resource Planning (ERP) systems are configurable, commercial off-the-shelf software packages designed to enable an organization to integrate operational and management processes across a broad range of internal business activities, including procurement, accounting, finance, and human resources. ERP programs tend to be very large, involve a multitude of stakeholders, and take a long time and considerable cost to implement. Such programs often cost more and take longer than anticipated, and some do not deliver the intended benefits when completed. Careful planning is critical to their success.

This report emanates from a RAND Project AIR FORCE Resource Management Program fiscal year 2012 project, "Why Do Big Air Force and Department of Defense Automation/Enterprise Resource Planning Systems Fall Short?" This research was sponsored by Lt. Gen. Christopher D. Miller (ret.), former Deputy Chief of Staff for Strategic Plans and Programs, Headquarters U.S. Air Force; and Dr. Jamie M. Morin, Assistant Secretary of the Air Force for Financial Management and Comptroller. The project had two complementary research goals. The first was to understand the key early planning issues associated with ERP programs and to provide the Air Force with recommendations for improving this planning. The second goal was to understand how these key early planning issues may be manifested during ERP program execution and to provide recommendations for improving early assessments of such programs. This analysis was conducted between October 2011 and July 2012.

This report is not a "lessons learned" case study analysis of troubled programs, but an analysis of steps the Air Force should take to improve the success of business transformation, of which ERP acquisition can be a part. This report should interest those involved in business transformation, those involved in the planning and development of defense business systems, and those concerned with the costs of such systems.

RAND Project AIR FORCE

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Summary

Information technology (IT) has come to play an increasingly significant role in the way organizations conduct business, evolving from a narrow tool for automation to a potential enabler of business transformation.[1] Enterprise Resource Planning (ERP) systems are prime examples of IT systems being pursued by the Department of Defense (DoD) to enable transformation and improve efficiency and effectiveness. ERP systems are configurable, commercial off-the-shelf (COTS) software packages that enable organizations to integrate operational and management processes across a broad range of internal business activities. The DoD and the military services have implemented or are in the process of implementing several ERP systems to enable business transformation goals and meet the fiscal year (FY) 2017 deadline for auditable consolidated financial statements (Public Law 99–433, 2010). The Air Force is implementing two such systems, the Air Force Integrated Personnel and Pay System (AF-IPPS) and the Defense Enterprise Accounting and Management System (DEAMS), and recently canceled a third, Expeditionary Combat Support System (ECSS). These ERPs were initiated with the intent of improving the effectiveness of the Air Force's business functions and providing operational support to the warfighter (e.g., through improved visibility and management of personnel and other assets). Importantly, especially in an era of constrained budgets, these ERPs were also intended to reduce the cost of Air Force business functions, which compete with operations and modernization for funds.

Implementing an ERP system can confer a range of benefits to an organization (e.g., see Davenport, 2000; Eckartz, 2009; Shang, 2002; Staehr, 2010). ERP systems promise to integrate business functions and data throughout an organization; provide a forcing function for process transformation; standardize software and processes; reduce development costs, schedules, and risks via proven COTS products; consolidate redundant systems; retire obsolete legacy systems; and potentially simplify sustainment. However, successful implementation generally entails significant business change because ERP systems typically affect a large number of organizational departments and processes. The DoD and the private sector have experienced numerous ERP failures as a result of a misplaced focus on the enabling IT rather than emphasizing the broader business change necessary to accomplish the transformation. The scope of change needed to transform an organization is vast, and considerable attention must be given to the planning and execution of the range of activities associated with the business transformation.

The Air Force asked RAND Project AIR FORCE (PAF) to review its ERP efforts and to identify the key early planning issues associated with successful ERP programs and the ways in which early planning, or lack thereof, might affect ERP program execution. PAF was also asked

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[1] Business transformation definitions vary, but the term generally refers to strategic, enterprise-wide change that has a profound impact on an organization's capabilities, environment, and performance (e.g., see Capgemini, 2012).

to recommend options for improving the Air Force's planning and early assessments of ERP programs. Through review of relevant business literature and interviews with a broad cross-section of experts, stakeholders, and senior government leaders, PAF identified the key conditions that must be achieved to facilitate the success of ERP-enabled business transformation, the challenges the Air Force must address to achieve those conditions, and options for overcoming these challenges. Our focus on ERP programs is not meant to suggest that the Air Force or DoD should view ERP systems as a preferred business IT solution for all circumstances. In fact, as explained throughout this report, ERP systems have transformative potential but are accompanied by a range of conditions for success that can be challenging to achieve. Finally, this report is not a "lessons learned" case study analysis of troubled programs, but an analysis of steps the Air Force should take to improve the success of business transformation, of which ERP acquisition can be a part.

Conditions for Successful ERP-Enabled Business Transformation and Challenges Facing the Air Force

The research team organized the conditions for successful ERP-enabled business transformation into five categories: business case, governance, business process reengineering (BPR), organizational change management (OCM), and IT acquisition. These are not necessarily sequential categories of activities; many are done simultaneously. In each of the five areas, the team also identified challenges the Air Force must address.

Business case. The initial purpose of a business case is to justify a project's required investment; however, business cases are also increasingly recognized as a planning and management tool to ensure that the business benefits sought are ultimately realized. An effective business case should articulate the transformational goals and desired benefits that are aligned with an enterprise business strategy. In the context of this report, an Air Force enterprise business strategy would address, at a high-level, how business operations will support the operational priorities of the Air Force. It describes the principles, goals, and objectives that are the foundation for an Air Force business enterprise architecture. It also is the framework for cross-functional decisionmaking and the adjudication of touchpoints between functionals. Additionally, it supports other higher-level strategies as required. The business case should include all associated costs, risks, and a realistic schedule. This requires a clear understanding of both the current (or "AS-IS") environment and the target (or "TO-BE") environment, which achieves enterprise goals. These environments include processes, the organization, and IT, and their understanding should include cost and performance.

The Air Force has struggled in meeting these conditions for success, both in articulating an enterprise-wide business strategy and understanding the complexities of the AS-IS and TO-BE business environments. This impairs its ability to carry out the analyses and activities that aid in building a solid business case.

Governance. Governance is decisionmaking to advance an organization's goals and objectives. The governance structure and related decisionmaking criteria should be grounded in the enterprise business strategy and business case and should be as simple and responsive as

possible, with clearly defined authority and roles and responsibilities, ideally led by a single person or a small group.

The Air Force faces several challenges in achieving these conditions. These include untimely or pro forma business cases not aligned with an Air Force-wide business strategy or other functional visions; a bifurcated organizational structure, with the Secretary of the Air Force (SECAF) responsible for business and the Chief of Staff of the Air Force (CSAF) responsible for operations/command; a multitude of influential stakeholders operating within functional stovepipes; and conflicting laws, regulations, and policies.

BPR. This is defined as the radical redesign of business processes to achieve dramatic improvement in business performance (Hammer and Champy, 2003) and has been widely identified in the literature as a critical success factor for ERP implementations. BPR should drive the enterprise's processes toward achieving the benefits articulated in the business case. It may or may not be enabled by IT. For BPR to succeed, a number of elements are necessary, including leadership support and communication of the vision, goals, motivation, and importance of the BPR project to stakeholders. Senior leadership, middle management, and support staff must have sufficient knowledge of BPR, and the organizational and incentive structures must support a cooperative environment that fosters communication, confidence, and trust. Ideally, IT processes should be adaptable to minimize the need for software customization.

As noted above, the Air Force has faced a number of challenges in this area, including the lack of a clearly understood, broadly embraced strategy with respect to business transformation and the need for a better understanding of AS-IS and TO-BE processes. Indeed, due to the multifunctional and stovepiped nature of the Air Force, it is unlikely any individual has complete knowledge of any process from end to end. BPR is constrained by laws, regulations, and policies, potentially limiting opportunities to change processes in lieu of COTS customization.

OCM. This is a term used to describe an organization's efforts to garner support for changes and encourage their adoption. These efforts are key to transformation, should be well thought out, and should have clearly defined implementation strategies. Successful OCM requires active leadership support, synchronization with the business case, and employee involvement. Specific activities include stakeholder analyses, formal and informal communication, education, and training.

Air Force ERP programs have struggled to overcome organizational challenges for several reasons, including a stovepiped organizational structure and culture, frequent leadership turnover, and limited options for incentives. OCM activities are frequently mistimed or narrow in focus, and there are disincentives to full disclosure of some potential benefits of change (e.g., financial and personnel savings) because the functional owner may not reap them or control those resources.

IT acquisition. If an IT acquisition is required, the full range of potential alternatives should be evaluated against their ability to achieve the benefits stated in the business case. Should an ERP prove to be the appropriate solution, specific expertise in this technology should be assigned to the program, either organically or through independent consultants with appropriate expertise acting as trusted advisers/agents.

There is a natural tendency for any organization to focus prematurely on the candidate IT products before more fundamental considerations have been articulated and decided upon. In the case of ERPs, this is largely due to the undeniable appeal of a COTS solution that purports to provide "best of breed" functionality at lower development, training, and sustainment costs within a shorter timeframe—and supposedly all at lower risk because the system has been developed and deployed for other users. Unfortunately, realization of these benefits is far from automatic and requires substantial planning, expertise, and commitment from all stakeholders. Choosing among multiple alternative solutions requires an overarching business strategy and architecture to guide scoping decisions during planning before program execution, which has often been absent in the Air Force.[2]

DoD ERP programs also face some additional challenges, including constraints related to service missions, national security requirements, and the laws, regulations, and policies imposed by higher-level organizations. The successful planning and execution of ERP programs require specialized skill sets and knowledge that are not widely available, even within most commercial organizations.

What Should the Air Force Do?

This analysis provides specific recommendations for planning activities for ERP-enabled business transformation. We have grouped them in three time phases: *Pretransformation*, in which the initial conditions for transformation are established on an ongoing basis; *Transformation, Preprogram Initiation*, in which all the activities leading up to a materiel decision are performed; and *Transformation, Post-Program Initiation*, in which activities following the decision to pursue an IT acquisition are carried out.

Pretransformation. Before the transformation, the Air Force should

- promulgate and implement an Air Force enterprise business strategy and business enterprise architecture, developed by the USECAF in his/her role as the Air Force Chief Management Officer (CMO) and informed by the Vice Chief of Staff of the Air Force (VCSAF), to serve as the framework and foundation for future business transformations
- document an integrated AS-IS environment at the Air Force enterprise level (This provides the baseline for functional strategies and transformations and ensures coordination across functions leading to integrated solutions.)
- establish Air Force enterprise level governance co-chaired by the USECAF and VCSAF, using the Air Force business strategy as the foundation (Involving both the business and command/operations parts of the Air Force should facilitate integrated, cross-functional decisionmaking to optimize the Air Force enterprise.)
- expand CORONA meetings or create an equivalent forum to include assessment of compliance with Air Force business strategy.[3] (CORONAs are ongoing, so discussions at

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[2] An architecture is a formal blueprint for methodically and completely defining an organization's operational processes and enabling environment (U.S. Air Force, 2011b).

[3] CORONA meetings are held three times a year to provide a venue for the most senior leadership of the Air Force to consider important servicewide issues. These meetings are chaired by the SECAF and CSAF.

these meetings would reduce the impact of senior leadership turnover and increase business program stability. Simultaneously, it increases accountability in implementing Air Force business strategy.)

Preprogram Initiation. Before initiation of an IT acquisition program, the Air Force should

- develop a business case following the Business Capability Lifecycle (BCL) format for the IT acquisition consistent with enterprise goals and strategy, and aligned with Air Force business and IT enterprise architectures (Carter, 2011). In building the business case, the Air Force must place a greater emphasis on expected benefits and their realization. This includes:
    - establishing business metrics to measure progress toward the TO-BE environment
    - establishing accountability to the Air Force Corporate Structure by factoring benefits realization into decisions on future funding and program direction[4]
    - considering benefits-sharing with stakeholders to provide incentives for better disclosure and management of benefit realization
    - linking benefits with specific changes to business processes, organizations, and IT.

- develop the transformation governance structure for decisionmaking that advances the goals of the transformation (This needs to be done within the context of the Air Force business strategy and should be aligned with the Air Force enterprise business governance, which is responsible for advancing this strategy and should be co-chaired by the CMO and the VCSAF.)
- conduct BPR and develop TO-BE business processes before determining if a new IT acquisition is appropriate
- initiate appropriate OCM activities as soon as the decision is made to pursue a business transformation
- carry out a stakeholder analysis to identify potential organizational pitfalls and the feasibility of achieving desired benefits within a proposed timeline
- conduct a robust assessment, early in the process, of IT infrastructure and solution compatibility, data sources, structures, definitions, and quality to inform both BPR and IT planning activities.

Post-Program Initiation. After initiating the program, the Air Force should

- decide whether changing the updated business processes or customizing the system is more appropriate
- focus OCM on achieving acceptance of the new technology and required process/organizational changes, frequently accomplished by incentivizing the affected personnel
- update stakeholder analyses and OCM plans (communication, education, and training) as key decisions are made that affect the trajectory of the overall transformation

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[4] The Air Force Corporate Structure, as defined in Air Force Instruction 16–501 (U.S. Air Force, 2006), is a governance structure through which the Planning, Programming, Budgeting and Execution process is implemented. Its strength is the consistency of reviews through successive grade levels and experience within the functional staff. It provides balance in resource allocation decisionmaking.

- deliver IT in manageable increments, considering complexity, operational priorities (e.g., auditability, legacy system retirement), implementation of basic functionality before extensions, complete end-to-end processes where feasible, and coordination with related initiatives (e.g., reorganization, replacement or upgrades of legacy systems, changes in hosting environment)
- engage experts with in-depth knowledge of functional operations and others with relevant technology experience to guide ERP implementation.

Acknowledgments

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[1] All offices and ranks are current as of the time of the research.

Abbreviations

A1	Manpower, Personnel, and Services
A2	Intelligence, Surveillance, and Reconnaissance
A3/5	Operations, Plans and Requirements
A4/7	Logistics, Installations, and Mission Support
A8	Strategic Plans and Programs
A9	Studies & Analysis, Assessments, and Lessons Learned
A10	Strategic Deterrence and Nuclear Integration
AA	administrative staff
AF-IPPS	Air Force Integrated Personnel and Pay System
AFPEO	Air Force Program Executive Officer
AoA	analysis of alternatives
AQ	acquisition
BCL	business capability lifecycle
BES	business and enterprise systems
BPR	business process reengineering
CIO	chief information officer
CIRB	Combined Investment Review Board
CMO	chief management officer
COTS	commercial off-the-shelf
CPI	continuous process improvement
CSAF	Chief of Staff of the Air Force
CVA	Assistant Vice Chief of Staff of the Air Force
DAMIR	Defense Acquisition Management Information Retrieval
DCMO	Deputy Chief Management Officer
DBS	defense business system
DFAS	Defense Finance and Accounting Service
DEAMS	Defense Enterprise Accounting and Management System

DITPR	DoD IT Portfolio Repository
DoD	Department of Defense
ECSS	Expeditionary Combat Support System
ERP	enterprise resource planning
FM	financial management and comptroller
FMO	functional management office
GAO	Government Accountability Office
GOTS	government off-the-shelf
IA	international affairs
IE	Installations, Environment and Logistics
IG	Inspector General
IT	information technology
MDA	Milestone Decision Authority
MDD	Materiel Development Decision
MR	Manpower and Reserve Affairs
OCM	organizational change management
OMB	Office of Management and Budget
OSD	Office of the Secretary of Defense
PMO	program management office
PPBE	Planning, Programming, Budgeting, and Execution
RICE	reports, interfaces, conversions, and extensions
SAF/FMP	Deputy Assistant Secretary for Financial Operations
SAE	Service Acquisition Executive
SECAF	Secretary of the Air Force
SOA	service-oriented architecture
SP	space
USD(AT&L)	Under Secretary of Defense for Acquisition, Technology & Logistics
USECAF	Under Secretary of the Air Force
VCSAF	Vice Chief of Staff of the Air Force

1. Introduction

Background

Over the years, information technology (IT) has played an increasingly significant role in the way organizations conduct business. Initially, IT was used chiefly to achieve operational efficiencies by automating routine tasks of existing business processes. Subsequently, IT began to be used to enable improved management planning and decisionmaking, primarily through the collection, analysis, and timely dissemination of improved data. In some instances, IT has even served as the key enabler of an organization's strategic goals.[1] In sum, IT has evolved from a narrow tool for automation to a potential enabler of business transformation.[2]

Enterprise Resource Planning (ERP) systems, which grew out of manufacturing resource planning systems in the 1990s, are prime examples of the transformative potential of IT. ERP systems are configurable commercial off-the-shelf (COTS) software packages that enable an organization to integrate operational and management processes across a broad range of internal business activities, including procurement, accounting, finance, and human resources (see Figure 1.1 for a comparison of traditional IT and integrated ERP concepts). ERPs can confer a range of benefits to an organization that are strategic, managerial, operational, organizational, and technological in nature (e.g., see Davenport, 2000; Eckartz, 2009; Shang, 2002; Staehr, 2010).

Figure 1.1. Traditional Stovepiped IT vs. Horizontally Integrated ERP Concepts
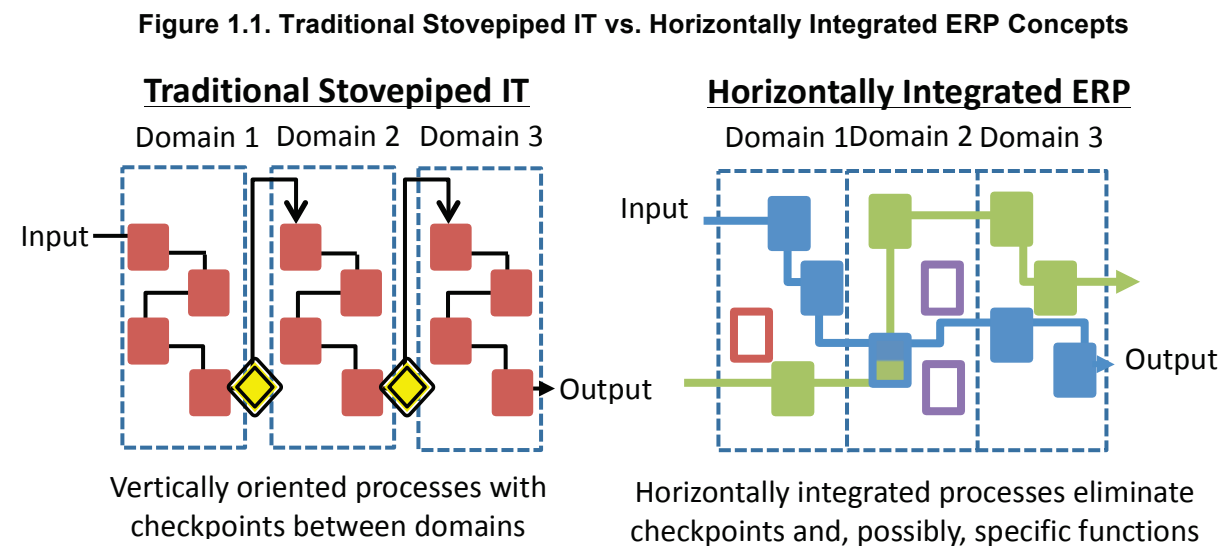
Source: Adapted from Sommer, 2006, pp. 125–126

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[1] Examples of this are United Parcel Service, which invested heavily in IT in the 1990s to achieve strategic goals and in doing so attained leadership in its industry, as well as Amazon and Dell, whose business models hinge on the use of IT (Ward and Daniel, 2006).

[2] Business transformation definitions vary, but the term generally refers to strategic, enterprise-wide change that has a profound impact on an organization's capabilities, environment, and performance (e.g., see Capgemini, 2012).

Regardless of the reason an organization pursues an ERP, doing so generally entails significant business change. This is because ERP systems, by virtue of their enterprise scope, affect a large number of organizational departments and processes. Thus, ERP systems ought to be viewed as part of broader business change initiatives rather than as simply IT projects. Indeed, an incomplete appreciation of this point has led to numerous ERP failures in both the private and public sectors.

The Department of Defense (DoD) and the military services have implemented or are in the process of implementing several ERP systems to enable business transformation goals and meet the fiscal year (FY) 2017 deadline for auditable consolidated financial statements (Public Law 99-433, 2010). The Air Force is implementing two such systems, the Air Force Integrated Personnel and Pay System (AF-IPPS) and the Defense Enterprise Accounting and Management System (DEAMS), and recently canceled a third, Expeditionary Combat Support System (ECSS).[3] These ERPs were initiated with the intent of improving the effectiveness of the Air Force's business functions and providing operational support to the warfighter (e.g., through improved visibility and management of personnel and other assets). Importantly, especially in an era of constrained budgets, these ERPs were also intended to reduce the cost of Air Force business functions, which compete with operations and modernization for funds.

In spite of the importance of these ERP systems to DoD business operations, the costs of ERP acquisition programs are growing, their schedules are slipping, and they face the risk of not delivering their desired business benefits. For example, a recent DoD Inspector General (IG) report assessed six of these ERP systems and reported schedule delays of 1.5–12.5 years and cost increases totaling $8.0 billion (a total of 110 percent cost growth over original baseline estimates) (DoD IG, 2012). An earlier 2010 Government Accountability Office (GAO) report examined a different set of six ERP programs and reported similar cost and schedule overruns, as well as risks of not realizing intended business benefits (GAO, 2010).

These difficulties are not unique to the Air Force, or even to public-sector organizations. Indeed, the past two decades are rife with spectacular ERP failures in both the private and public sectors. The importance and difficulty of ERP system implementation has prompted a vast body of literature on conditions for ERP success, which we summarize in the next section.

Conditions for Success and Challenges

The notion of "success" in the ERP literature is the realization of desired business benefits,[4] enabled by the implementation of an ERP system, within budgeted cost and schedule. To achieve

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[3] The analysis presented in this report was completed prior to the Air Force termination of the ECSS program on November 8, 2012 (Inside the Air Force, 2012).

[4] A business benefit may be defined as an advantage gained by a stakeholder, or group of stakeholders, that arises from an organization carrying out new activities, improving upon the activities it already carries out, or stopping activities that are no longer required (Ward and Daniel, 2006).

success, several often-cited conditions must be met, including the following (e.g., Finney and Corbett, 2007):

- clear objectives and a solid business case for the ERP system and broader business transformation[5]
- top management commitment and active support throughout the transformation lifecycle
- effective governance structures for decisionmaking throughout the transformation lifecycle
- alignment of the organization's business processes and those in the ERP software through business process reengineering (BPR) rather than customization of the software[6]
- effective and appropriate organizational change management (OCM) techniques throughout the transformation lifecycle[7]
- experienced ERP program management
- appropriate ERP implementation strategy and time frame, including data management.

While these conditions for success apply to private- and public-sector organizations alike, public-sector organizations, such as the Air Force, face heightened challenges in achieving them. Laws, regulations, and policies that govern who can perform work and how work is performed (combined with the size and complexity of the DoD) constrain the organization's ability to address common challenges, such as cultural resistance to change and obtaining the relevant ERP experience and expertise. In addition, DoD organizations are challenged by a cultural tendency to realize an operational vision through the acquisition of a product, as well as frequent turnover of senior leadership, acquisition, and functional staff. The number of stakeholders in the DoD, each potentially having a unique chain of command, also results in a more fragmented and inefficient leadership and governance structure than is typically observed in a private corporation. These challenges have led to the observation that "implementing an ERP solution is the largest, most complex technology effort most public-sector organizations will ever attempt" (KPMG, 2011).

While many of the challenges listed above may manifest during program execution, the seeds of these challenges are sown well before program execution decisions are made. A 2011 DoD memorandum pointed to the root causes of ERP challenges that exist at program inception as being "more profound" than those during management and execution (Bliss, 2011). As discussed in the next section, we therefore focus on these early planning issues in this report.

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[5] The initial purpose of a business case is to justify a project's required investment; however, business cases are also increasingly recognized as a planning and management tool to ensure that the business benefits sought are ultimately realized.

[6] BPR is defined as the radical redesign of business processes to achieve dramatic improvement in business performance (Hammer and Champy, 2003).

[7] OCM is a term used to describe an organization's efforts to garner support for changes and encourage their adoption.

Overview of Research

Research Objectives

The research documented in this report had two complementary objectives:

- to outline the key early planning issues associated with ERP programs and provide the Air Force with recommendations on how it can improve this planning in the future
- to determine how these issues might manifest during ERP program execution and provide recommendations on how the Air Force can improve its early assessments of ERP programs.

By "key early planning issues" we mean the critical issues that ought to be considered before and shortly after an acquisition program is initiated.[8] With respect to the Business Capability Lifecycle (BCL) framework,[9] this point in time is the end of the Investment Management Phase, or Milestone A. This report is not a "lessons learned" case study analysis of troubled programs, but an analysis of steps the Air Force should take to improve the success of business transformation, of which ERP acquisition can be a part.

The focus on ERP programs is not meant to suggest that the Air Force or DoD should view ERP systems as the preferred business IT solution for all circumstances. In fact, as explained throughout this report, ERP systems have transformative potential but are accompanied by a range of conditions for success that can be challenging to achieve.

Research Approach and Framework

To achieve our research objectives, we began by carrying out an extensive review of success factors, lessons learned, and best practices related to ERP planning. This was accomplished through a review of the private-sector ERP literature, as well as the relatively limited public-sector literature, and through discussions with experts from ERP software vendors, system integrators, academics, and consultants. The second phase of our research involved in-depth investigation of the major Air Force ERP programs—AF-IPPS, DEAMS, and ECSS. We reviewed program documentation available to us through Defense Acquisition Management Information Retrieval (DAMIR), DoD IT Portfolio Repository (DITPR), program management offices (PMOs), functional management offices (FMOs),[10] and our research sponsors. In addition, we engaged in discussions with individuals from the following stakeholder communities:

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[8] An in-depth exploration of implementation issues occurring after program initiation was outside the scope of this analysis.

[9] This framework governs IT acquisitions in excess of $1 million (Carter, 2011).

[10] DAMIR and DITPR are DoD acquisition databases. The PMO is the acquisition office executing the program and the FMO is the office representing the "user" community of the program.

- **Government:** functional sponsor, FMO, PMO, acquisition leadership, Service and Office of the Secretary of Defense (OSD) Deputy Chief Management Officer (DCMO) staff, and Service Chief Information Officer (CIO) staff.
- **Contractors:** system integrators, software vendors, and ERP expert consultants.

To organize the planning issues considered in our research, we employed the framework depicted in Figure 1.2 for business transformation associated with ERP systems. Business transformation is justified, and guided at a high level, by the business case. Executing the transformation entails decisions across a range of activities and stakeholder communities. The criteria for such decisions are derived from the business case. A transformation brings an organization from a current (or AS-IS) business environment to a target (or TO-BE) one, each including business processes, the organization, and IT. Business processes codify the way business is done; and the organization, which is made up of people, culture, and organizational structure, carries out these processes with the aid of IT (e.g., an ERP system). BPR, OCM, and IT acquisition directly enable the transformation of the AS-IS environment to the TO-BE environment. This framework was derived through a review of how ERP—and IT, more generally—delivers business value to organizations and the ERP success factor literature (e.g., Davenport 2000; Gulledge and Sommer 2003; Finney and Corbett, 2007; Nah and Delgado, 2006; Ward and Daniel, 2006).

Figure 1.2. Research Framework for this Analysis
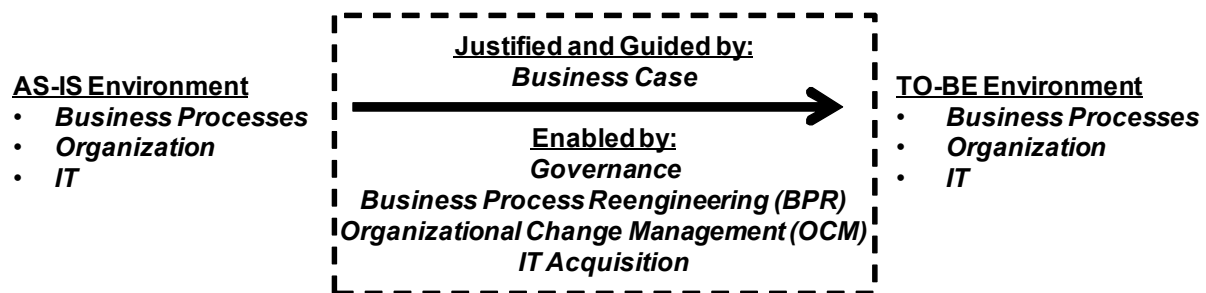
As suggested above, these five areas are deeply interconnected. The remainder of this report will clarify how the decisions and activities carried out in these areas inform each other and must be jointly orchestrated to ensure successful transformation. Moreover, these activities should be coordinated over time across different organizational echelons—enterprise, functional, and program—within the Air Force.

Overview of Report

This report is organized in accordance with the research framework depicted in Figure 1.2. The business case, which is the keystone document justifying and guiding the business transformation, is addressed in Chapter Two. Chapter Three addresses governance issues, which affect the effectiveness with which decisionmaking is conducted throughout the transformation. Chapters Four, Five, and Six address BPR, OCM, and IT acquisition, respectively. In each of

these chapters, conditions for success and Air Force challenges to meeting these conditions are described. Chapter Seven includes a summary of key findings and recommendations for improved planning organized by temporal phase: pretransformation; transformation, preprogram initiation; and post-program initiation. Appendix A outlines a suggested planning framework, which expands upon Figure 1.2 and encompasses the ideas presented in the report. Implications for ERP program assessment, which draw upon all of the above, appear in Appendix B.

2. Business Case

The purpose of the business case for an IT project has traditionally been to justify the investment required for the project, usually in financial terms. However, as the role of IT evolved from automating routine tasks of existing business processes to enabling fundamental business change—such as improving visibility of personnel and other assets in the case of Air Force ERPs—the role of the business case has expanded too.

The initial purpose of a business case is to justify a project's required investment. However, this justification must reflect the fact that projects involving IT—especially multifunctional IT, such as ERP systems—are part of broader business change initiatives. The business value offered by ERP systems often spans a range of benefits, many of which may not be easily measured in financial terms (e.g., reduced cycle time, better decision support, improved workforce skill and morale). Likewise, the costs and risks associated with ERP-enabled business change relate to a variety of activities beyond IT acquisition (e.g., BPR and OCM).

Previously used to justify a project's investment, the business case is increasingly being recognized as a planning and management tool that can be used to ensure that the business benefits sought are ultimately realized (Eckartz et al., 2009; Ward and Daniel, 2006). The need for such a tool stems from the recognition that business benefits are the motivation for the project and from the observation that benefits that are not actively managed are at high risk of not being realized. Non-Air Force DoD ERP experience suggests that shortfalls in delivered business capability can result, even if programs successfully pass through acquisition milestones.

There are many possible formats and methodologies for assembling a business case.[1] However, in all instances, an enterprise business strategy and identification of business goals and derived benefits should drive the analysis underlying the business case because this is the motivation for pursuing IT-enabled business change. Realizing business benefits entails a coordinated set of activities, as suggested by Figure 1.2 in Chapter One, and these activities must therefore be considered in the business case, both when justifying the project's investment and when planning the realization of benefits. In particular, identifying these enabling activities provides the basis for analyzing the full range of IT and non-IT costs, schedule drivers, and sources of risk. Finally, justification of the solution for meeting the stated business goals often entails a comparison to alternatives. The basis for this justification should be an assessment of the business value offered by each alternative relative to the stated enterprise goals, in view of the associated cost, schedule, and risk.

In the context of this report, an Air Force enterprise business strategy would address, at a high-level, how business operations support the operational priorities of the Air Force. It describes the principles, goals, and objectives that are the foundation for an Air Force Business

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[1] We refer the interested reader to Nafeeseh and Al-Mudimigh (2011); Gunasekaran, Ngai, and McGaughey (2006); Mercken (2005); and Ward and Daniel (2006) and references therein for a survey.

Enterprise Architecture. It also is the framework for cross-functional decisionmaking and the adjudication of touchpoints between functionals. Additionally it supports other higher-level strategies as required. This business strategy could include, but not be limited to, the following components:

- architecture of enterprise business operations (e.g., service-oriented architecture, Oracle-based ERPs, location of shared functions, data standards for shared data)
- enterprise migration timeline (e.g., auditability by 2017)
- enterprise priorities (e.g., total asset visibility, reduction of personnel costs, auditability).

In the next section, we highlight the critical elements required to build a rigorous business case. These conditions for success are drawn from our research into private- and public-sector ERP experience; links to recent DoD acquisition policy and guidance are made when appropriate. Following this, we describe the challenges that the Air Force faces in meeting these conditions for success. Note that in this report, we refer to the business case in a broader sense than defined by the BCL framework. The business case discussion in this report applies to business change initiatives regardless of whether the initiative involves IT acquisition. In contrast, the BCL business case policy and guidance is only applicable when an IT component will be procured as part of the business change effort.[2]

Conditions for Success

Our research indicates that successful ERP business cases require the following conditions:

- alignment between enterprise business goals and strategy
- detailed definition of business benefits
- linkage of benefits to enabling activities
- comprehensive analysis of alternatives.

We discuss each of these conditions in more detail.

Alignment Between Enterprise Business Goals and Strategy

The business case should begin with identification of enterprise business goals that motivate the business change. These goals should be a high-level response to business drivers—internal and external pressures for change—acting upon the organization. For public-sector organizations such as the Air Force, examples of such drivers could be unsustainable costs of operating and maintaining aircraft or a statutory requirement for auditable financial statements.

These enterprise business goals ought to be consistent with a broader enterprise strategy that considers the full range of drivers acting upon it. At the DoD level, the National Defense Strategy produced by the Secretary of Defense (and informed by the President's National

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[2] We acknowledge that the BCL business case requires that the full spectrum of Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel, and Facilities (DOTMLPF) considerations be addressed before decisions on whether IT acquisition is necessary to fulfill needs.

Security Strategy) is the overarching enterprise strategy, and the Strategic Management Plan, which supports it, is the DoD strategy document for business operations. This DoD-level guidance should inform analogous strategies for DoD organizations, such as the Air Force. The importance of setting goals aligned with enterprise strategy may be obvious, but making this explicit in a business case is especially critical for ERP-enabled business change, because it provides guidance for governance and OCM activities involving diverse stakeholders who often have conflicting goals and priorities. Moreover, explicit alignment with an enterprise strategy fosters compatibility and avoids duplication with other business change initiatives being carried out within the enterprise. For example, to achieve a goal of financial auditability, the Air Force may conclude that it is more expedient and cost-effective to increase the size of its financial management workforce along with incremental changes to business processes and systems. However, if the Air Force is pursuing improved asset visibility as part of its business strategy, it may instead decide in favor of ERP-enabled business change that cuts across multiple functional domains (e.g., financial management, logistics, human resources) and that can also enable auditability. However, as will be explained throughout this report, carrying out such an expansive initiative involving stakeholders with potentially conflicting priorities requires explicit alignment of goals and Air Force strategy.

Recent DoD IT acquisition policy and guidance (Carter, 2011; DoD, 2012a) is consistent with this condition for success. In particular, the identification of business goals and their alignment with strategy are required in the "problem statement" portion of the DoD BCL business case that is submitted prior to Materiel Development Decision (MDD), the entry point to the acquisition system.

Detailed Definition of Business Benefit

After defining the enterprise business goals, articulating how specific benefits will achieve high-level goals is the next critical step. A business benefit may be defined as an advantage gained by a stakeholder, or group of stakeholders, that arises from an organization carrying out new activities, improving upon the activities it already carries out, or stopping activities that are no longer required (Ward and Daniel, 2006).

Business benefits should, to the extent possible, be expressed in measurable terms in the business case—even using metrics requiring subjective assessment (e.g., for workforce morale)—and include AS-IS and TO-BE values along with a method for measurement to help track their realization. While metrics that can be expressed in financial terms are attractive in that they may be aggregated into an economic analysis along with project costs, the importance of non-financial benefits for IT systems, such as ERPs, should not be discounted because they, too, can provide significant business value. Note that providing values for metrics entails an understanding of AS-IS and TO-BE performance and cost, which may require simulation/modeling tools, benchmarking, or pilot implementations if the underlying benefit entails a new activity (Ward and Daniel, 2006). Each benefit should also have an "owner" who is responsible for its realization. Ideally, each benefit owner is an individual—but can also be a small group of individuals—receiving the benefit, thus guaranteeing an incentive to help ensure that the benefit is realized. Finally, it should be noted that, while articulating a complete set of

benefits is ideal when building the business case, unplanned business benefits frequently arise after the IT system is implemented and the organization better understands how to exploit the IT to obtain business value.[3]

Recent DoD IT acquisition policy and guidance supports this. Detailed definition of benefits and the need for a "capability delivery plan" are articulated as key portions of the DoD BCL business case. However, the capability delivery plan is a high-level acquisition-oriented artifact that does not necessarily address the full scope of benefit management.[4]

Linkage of Benefits to Enabling Activities and Considerations

A critical part of building the business case is to characterize how the business benefits will be delivered through transformation of AS-IS to TO-BE business processes, organization, and IT (Eckartz et al., 2009; Ward and Daniel, 2006). Recall that the activities and considerations enabling this transformation span governance, BPR, OCM, and IT acquisition. Consideration of these activities forms the basis for the DOTMLPF analyses required in DoD BCL business cases (Carter, 2011; DoD, 2012a). As with benefits, promoting accountability through ownership (i.e., execution and funding) of these activities and the changes they are intended to produce is critical. These activities and their conditions for success are discussed in subsequent chapters of this report.

Establishing the link between benefits and enabling activities is critical for at least three reasons. First, such linkage provides the foundation for inclusive cost, schedule, and risk analyses in the business case because it helps ensure that all relevant activities and issues are identified. Second, a rough cost, schedule, and risk assessment—that is, an initial rough business case—often leads an organization to refine, delay, or even abandon the goals and benefits it wishes to pursue if the perceived cost, schedule, and risk are too great. Finally, the link between benefits and enabling activities provides the foundation for managing the process to realize the benefit throughout the project's lifecycle.

In developing this link, DoD acquisition policy requires that IT acquisition be considered only after non-IT enablers have been considered and deemed inadequate to meet the desired business goals (Carter, 2011). This policy helps retain focus on achieving business benefit, rather than on acquiring IT as the goal. In general, different TO-BE solutions—each comprising business process, organization, and IT components—may achieve the same high-level business goals. However, if some form of IT acquisition is needed in all cases, this analysis must be summarized at MDD in the "problem statement."

Comprehensive Analysis of Alternatives

As noted above, the process of building the business case will often reveal that alternative solutions exist for achieving the high-level business goals. Chapter Six addresses the range of IT

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[3] Issues and methodologies on identification of benefits can be found in Eckartz et al. (2009), Love et al. (2005), Mercken (2005), and Ward and Daniel (2006) and references therein.

[4] See Ward and Daniel (2006) for a comprehensive treatment of benefit management.

components of these solutions that should be considered. Once the range of alternatives has been established, the basis for selecting the preferred alternative should be an assessment of the business value offered by each, in view of the associated cost, schedule, and risk. Note that selection of the preferred alternative generally involves some subjectivity because it involves a comparison of more than just an economic analysis of costs and financial benefits; it also entails a comparison of nonfinancial benefits (e.g., a modular or evolutionary migration path) and risks that can be dissimilar in kind. Nevertheless, capturing the full range of benefits, costs, risks, and schedules builds the foundation for making an informed and defensible alternative selection.

If the alternative solutions involve an IT component, the venue for assessing alternatives is the Analysis of Alternatives (AoA), just after MDD. To comply with DoD IT acquisition policy, the problem statement and results of the AoA are part of the DoD BCL business case that must be submitted before program initiation (i.e., Milestone A).[5] The timing of the business case submission ensures that a sound justification for the IT-enabled initiative exists before committing substantial funds. However, as noted above, this relies on a good understanding of the AS-IS environment and supporting analyses of enabling activities. That said, the business case is a living document refined over time as subsequent activities shed further light on benefits and associated changes (Davenport, 2000; Eckartz et al., 2009; Ward and Daniel, 2006).

Challenges

Air Force ERPs have been motivated by business transformation goals. However, discussions with Air Force functional stakeholders and a 2008 GAO report indicate that the transformational goals underlying ECSS and DEAMS were not coordinated with an overarching Air Force or DoD enterprise business strategy.

Moreover, the translation of these transformation goals into specific benefits *before* program initiation has been lacking. Shortcomings in early benefit definition have included the absence of metrics; metrics that cannot be tracked; missing AS-IS values for metrics; missing or unrealistic TO-BE values for metrics; and the absence of any benefit description at all. As explained in the previous section, a poor definition of benefits undermines an assessment of the potential business value of the ERP-enabled initiative and significantly imperils the realization of its business benefits.

There are several reasons for bad benefit definition. These include, for example, a poor understanding of the AS-IS business environment (i.e., processes, costs, performance), which precludes establishing a baseline. The absence of enabling activities to establish the link between benefits and required business process, organizational, and IT changes could result in missing or unrealistic TO-BE metric values.[6] Finally, disincentives have been cited as reasons for omitting

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[5] DoD IT acquisition policy also requires that summaries of other documents and analyses be included in the business case. See Carter (2011) for further details.

[6] The best metrics typically measure business results rather than the performance of intermediate processes. Examples might include time to complete end-to-end processes, error rate, inventory reduction, processing efficiency, savings from retiring legacy systems, or the accuracy or utility of available management information.

descriptions of manpower and monetary efficiencies or other benefits. These benefits are often conferred broadly on the Air Force or DoD enterprise as a whole, so individual stakeholders may not benefit directly and may even be worse off if their manpower or funding is reduced before the overall efficiency is realized.

Related to the lack of benefit definition is the failure to establish the link between benefits and enabling activities before initiating the ERP program. As discussed in the previous section, the absence of this link impairs a full consideration of cost, schedule, and risk, which can in turn undermine the assessment of solution alternatives. In terms of non-IT considerations, the impact of BPR, governance, and OCM all appear to have been underappreciated. BPR itself is an intensive activity that directly influences cost and schedule. Moreover, the rigor with which BPR is conducted affects the risk of realizing benefits as well as cost and schedule. Additionally, the absence of critical OCM activities and effective governance could delay decisionmaking (leading to schedule delay and cost growth), and could also result in compromises on requirements that might lead to diminished realized business benefits or even program cancellation. With respect to IT enablers, data management and compatibility with IT infrastructure—which are significant drivers of cost and schedule, and sources of risk—also appear to have been underappreciated.

Recent DoD IT policy and guidance have been positive steps toward mitigating these challenges, as they are consistent with the conditions for success noted throughout this chapter. To be a truly useful artifact for ERP-enabled business transformation, however, the business case must be carried out—and enforced—with the completeness and rigor intended by this policy and guidance.

Summary

The business case is the keystone document of a business transformation initiative. Its dual purposes are to justify the initiative and help plan and manage the realization of its benefits. While there are many possible formats and methodologies for assembling a business case, the enterprise business goals and derived benefits being pursued should drive its formulation. Benefits should be defined and quantified to the extent possible. Moreover, it is essential to explicitly tie these benefits to the enabling business process, organizational, and IT changes for the solutions being considered. It helps refine the scope of the solution alternatives and it provides the foundation for cost, schedule, and risk analysis, as well as the basis for comparing the alternatives.

The Air Force, however, struggles in meeting these conditions for success. A major reason is that it has a poor understanding of the AS-IS business environment, which in turn impairs its ability to carry out the analyses and activities that aid in building a solid business case. The next four chapters elaborate on conditions for success and challenges with respect to these supporting activities and analyses, and Chapter Seven provides recommendations to help the Air Force overcome barriers to success.

3. Governance

Governance should support focused decisionmaking using criteria based on the business case to achieve the organization's overall goals. Because these decisions affect all levels and areas of the transformation, governance needs to be consistent across echelons (from the enterprise to the specific program level); align stovepipes; and be applied across BPR, OCM, and IT acquisition.

Decisionmaking criteria are a direct output of the business case. These criteria establish a foundation for resolving issues in a timely and effective manner—regardless of the governance structure selected (multi-echelon or multifunctional).[1] Value-added governance must be timely and effective enough to support the success of the transformation.

The decisionmaking processes, and therefore the governance structures, differ between industry and government; however, the conditions for success are similar. Differences include decisionmaking approaches; constraints such as laws, regulations, and policies; budgeting processes; and oversight levels.

Conditions for Success

Regardless of whether it is to be applied to successfully achieving an enterprise transformation or executing a specific program, effective governance should be based on decision criteria understood by all stakeholders.[2] Ideally, these criteria should be grounded in the facts of the business case and used to reinforce achieving the defined and agreed-upon goals and objectives. Basing them on the business case—which is most likely established early in the activity when all the participants are focused on broader enterprise-level perspectives and less likely to be focused on self-interest—drives objectivity and transparency (Strachan, 2008).

A well-devised governance structure should be simple and responsive, and it should guide transformational activities toward achieving the organization's business objectives. It fosters rational decisionmaking and timely direction, continually moving the transformation forward.

Ideally, governance should provide well-defined roles and responsibilities, and clear boundaries. It is preferable that governance be led by a single decisionmaker who is reputable, knowledgeable, and fair. If a decisionmaking committee is unavoidable, then smaller is better, as is maintaining transparent and well-understood processes. A clear decisionmaking authority moves project teams forward; reduces revisiting decisions; and minimizes project delays, costs, and team frustration (KPMG LLP, 2011).

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[1] Multi-echelon means one person is in charge and has responsibility for implementation decisions. This centralized approach is also achievable through a small group of top-level executives because one person rarely has all the required information. Multifunctional refers to a body of members with experience and knowledge across a broad scope of areas.

[2] Stakeholders should be identified and levels of influence assessed as part of an OCM stakeholder analysis.

Thus, effective governance for Air Force enterprise business activities should be visibly supported by the Air Force's top senior leaders—SECAF, CSAF, the Under Secretary of the Air Force (USECAF), and VCSAF.[3] This group needs to ensure on a regular basis that the decisionmakers are advancing their activity in alignment with the Air Force enterprise vision—more frequently if problems develop.[4]

Challenges

Lack of Guidance from Business Case

As described in Chapter Two, an Air Force–wide enterprise business strategy should be the foundation for the business case. However, it appears the business cases for many Air Force transformations are more narrowly focused on functional lines instead of a widely acknowledged and universal Air Force enterprise strategy. These business cases also appear to be documented after the fact, sometimes even following a decision to pursue an IT solution, which is a decision that should be made only after a full business case review. In these circumstances, the foundation for decisionmaking criteria, definition of roles and responsibilities, and transparency are all unfocused—making it difficult to integrate governance across business functions.

Stovepiped Organizational Structure

Another complicating factor to effective governance is organizational structure. Privately and publicly held companies usually have a multi-echelon structure with a chief executive officer as the ultimate decisionmaker and integrator. Functional leaders/corporate officers (e.g., the chief financial officer, chief operating officer, chief technology officer, CIO, etc.) report to the chief executive officer, who in this multi-echelon structure typically has the final say on enterprise decisions (e.g., choosing to implement an ERP) as well as the tools to drive it to success,[5] and will be there long enough to see it through.[6]

In the DoD and Air Force, business decisionmaking is typically carried out by multifunctional committees working together to achieve consensus. This decision model has been shown to be less effective in timely decisionmaking, providing unambiguous guidance,

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[3] As the Air Force's chief management officer, the USECAF is responsible for "effectively and efficiently" managing "Air Force business operations" (Under Secretary of the Air Force, 2012).

[4] The Air Force has taken steps in providing this alignment (Under Secretary of the Air Force, 2012).

[5] Within the private sector, the leadership has the ability to offer incentive packages to encourage individuals to either support an initiative or seek employment elsewhere. This is not as easily accomplished within the public sector.

[6] Senior leaders transitioning approximately every four years (military rotations and political appointees' transience) inject instability. For instance, an outgoing official might delay a critical decision so that it can be made by the incoming individual, who will live with the outcome. Conversely, an outgoing official's decision could be studied, delaying implementation, or reversed by the incoming official who may have differing priorities or views. These situations provide opportunities for revisitation, confusion, and discord; nothing is ever perceived as "closed." Regardless, decisionmaking is delayed, additional risk is introduced, and costs and schedules increase.

controlling special interests, or being supported by midlevel managers (Sommer, 2011). However, this is the default governance structure within any Air Force transformation because multiple functional stakeholders are involved. They reside at multiple echelons, from the Air Force enterprise to a specific program focused on a single outcome.

Contributing to governance difficulties, the Air Force has divided itself organizationally into two parts loosely described as "business" and "operations/command."[7] As seen in Figure 3.1, business organizations (in red) report to the SECAF and operations/command (in blue) to the CSAF. This bifurcation affects governance during the Air Force's Planning, Programming, Budgeting, and Execution (PPBE) process and during preparation of the service's budget. The command side expects the business infrastructure to support operations, but business infrastructure often receives lower priority during the budgeting process.[8] Air Force functional stovepipes may have advocates on either the business or operations/command sides of the Air Force, or both.

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[7] The "business" side of the Air Force has civilian leadership, with the exception of Information Dominance and CIO, and includes Financial Management and Comptroller (FM), Manpower and Reserve Affairs (MR), Acquisition (AQ), Installations, Environment and Logistics (IE), Space (SP), and International Affairs (IA). The "operations/command" organizations have military leadership and include Manpower, Personnel, and Services (A1), ISR (A2), Operations, Plans and Requirements (A3/5), Logistics, Installations, and Mission Support (A4/7), Strategic Plans & Programs (A8), Studies & Analysis, Assessments, and Lessons Learned (A9), Strategic Deterrence and Nuclear Integration (A10), Reserve and National Guard, and the Surgeon General. There are teams where a civilian-run organization partners with a military-run one within the same functional area, e.g., MR and A1 or FM and A8. Administrative Staff (AA) and Assistant Vice Chief of Staff of the Air Force (CVA) support the offices of the SECAF and CSAF.

[8] During the PPBE process, various leaders advocate funding to address needs. Historically, day-to-day operations are prioritized over BPR, and OCM and recapitalization of weapon systems are prioritized over defense business systems (DBS).

Figure 3.1. Headquarters Department of the Air Force Organization Chart
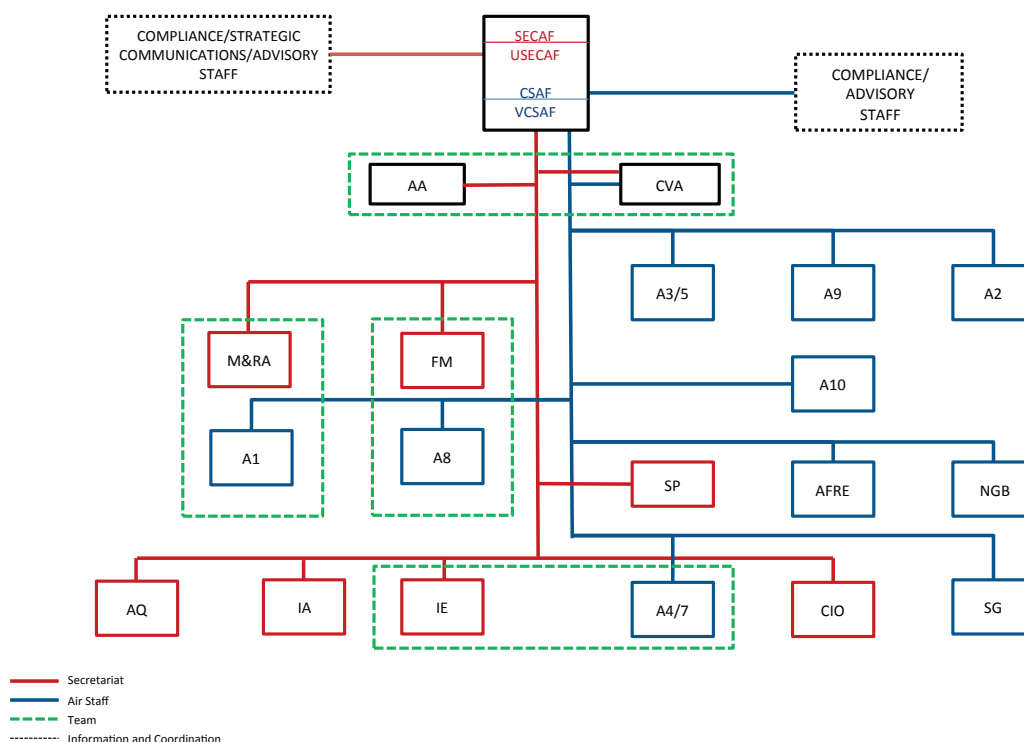
Source: Adapted from U.S. Air Force, 2011a.

Many stakeholders, who may be leaders of functional stovepipes, are affected by enterprise transformations and naturally want to protect their interests. This desire to protect a specific interest could lead to optimizing a function at the expense of the enterprise. A functional transformation will have touchpoints with other functional areas (e.g., sharing financials between ECSS and DEAMS). Specific interests—frequently using laws, regulations, and policies as justification—have contributed to separate governance structures with multiple stovepipes and layers between the person with the problem and the ultimate decisionmaker(s). An example of this can be seen in Figure 3.2. While there are some horizontal connections, there are multiple management structures with three 'top' decisionmaking bodies. Acquisition is headed by the Under Secretary of Defense for Acquisition, Technology and Logistics (USD [AT&L]) and financial management by the Deputy Assistant Secretary for Financial Operations (SAF/FMP). Further complicating this structure is the Enterprise Steering Group, whose most senior member is the commander of the U.S. Transportation Command (USTRANSCOM/CC), a combatant commander. The relative ranking among these three top decisionmaking bodies, both official and unofficial, is unclear. Furthermore, within these silos there are multiple stakeholders and several layers within OSD and the services. A consequence of a multilayered, cross-functional governance structure is that information can be filtered, diluted, or otherwise changed. This potentially delays critical decisions or even results in the wrong problem being addressed. Regardless, either case could adversely impact cost, schedule, and benefits realization.

Figure 3.2. Example of an Air Force ERP Governance Structure
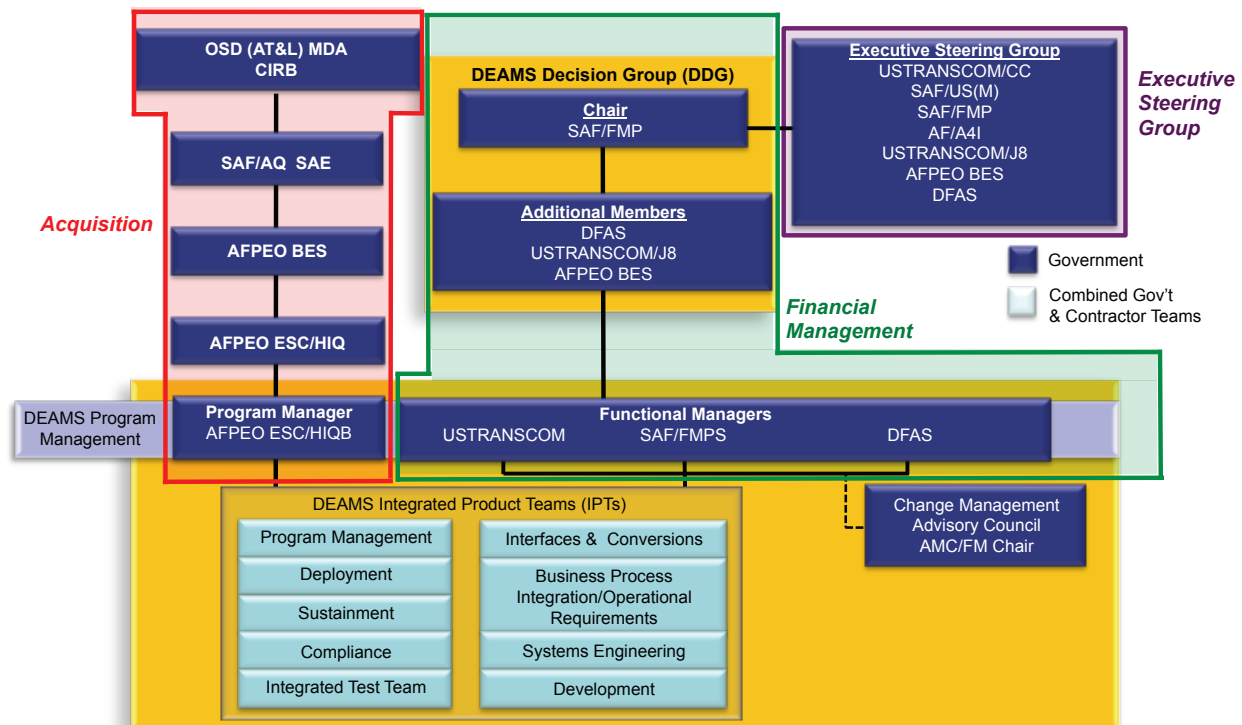
AFPEO=Air Force Program Executive Officer; BES=Business and Enterprise Systems; CIRB=Combined Investment Review Board; DFAS=Defense Finance and Accounting Service; MDA=Milestone Decision Authority; SAE=Service Acquisition Executive.
Source: Adapted from U.S. Air Force, March 22, 2012.

External stakeholders are an additional complication. As illustrated in Figure 3.2, DFAS and USTRANSCOM are both outside the Air Force, yet can heavily influence planning and decisionmaking. Additionally, any Air Force system needs to interact within the DoD environment and will be subject to OSD-promulgated policies and procedures, as well as congressional mandates. This can increase governance complexity with multiple layers of oversight.

Multiple Layers of Oversight

Public-sector governance also has additional oversight dictated by law with mandatory compliance or, in the case of regulations and policies, requirements to request waivers. Failing to address these initially could delay program execution, and could result in larger costs and schedule delays. Some significant laws, regulations, and policies include: the Clinger-Cohen Act (Public Law 104-106, 1996); 10 USC Section—Defense Information Assurance Program (U.S. Code, 2006); U.S. Office of Management and Budget (OMB) Circular A-130, "Management of

Federal Information Resources" (OMB, 2012); BCL (Carter, 2011); and the Defense Acquisition System directives and instructions (DoD, 2000; DoD, 2008).[9]

It would be simpler to contend with so many laws, regulations, and policies if they were consistent, but this is not always the case. One example of conflicting laws, regulations, and policies is an OMB CIO policy letter making agency CIOs responsible for improving management of large federal IT projects by identifying, recruiting, and hiring top IT program management talent. CIOs are directed to train and provide annual performance reviews for those leading major IT programs. Agency CIOs are to be held accountable for lowering operational costs, terminating or turning around troubled projects, and delivering meaningful functionality at a faster rate while enhancing the security of information systems (Lew, 2011). This appears to conflict with the Defense Acquisition System implemented in accordance with the provisions of Goldwater-Nichols and the services' Title 10 responsibilities to organize, train, and equip PMOs.[10] So, the OMB CIO policy letter and statutes identify different people to do the same activities.

Defense business systems (DBS) are already funded through the PPBE but have an additional layer of oversight through the BCL framework. This framework, established by the USD(AT&L) for DBS, is applicable to any DBS with at least $1,000,000 across all appropriations. The BCL includes an annual funds certification requirement prior to the program expending any funds (Carter, 2011). The BCL requires DBS funds, already appropriated and authorized through Congress, to be certified by the DBS Management Committee through its Investment Review Boards, before service execution. Within the services, this process is managed in the CIO or chief management officer (CMO) chains and is outside the traditional funding and acquisition communities. This increases program execution complexity as the program manager also needs to allow for the BCL certification process in order to keep to a schedule and maintain timely benefits realization.

Summary

Governance is decisionmaking to advance an organization's goals and objectives. For business transformations, governance should be based on and support the business case; it should be simple, flexible, and responsive; and ideally it should have a single reputable, knowledgeable decisionmaker at the top. The Air Force faces several challenges in accomplishing these conditions for effective governance. These include untimely or pro forma business cases not aligned with an Air Force vision or other functional visions, a bifurcated organizational structure with a multitude of influential stakeholders operating within functional stovepipes, and overlapping and conflicting laws, regulations, and policies.

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[9] Others include DoDD 8000.01, Management of the Department of Defense Information Enterprise (DoD, 2009); Goldwater-Nichols, Department of Defense Reorganization Act of 1986 (Public Law 99–433); and the annual National Defense Authorization Act.

[10] Goldwater-Nichols outlined the position of the Under Secretary of Defense for Acquisition and established the requirement for service acquisition executives to exclusively manage service acquisition functions. When the conflict was discussed with one of the services' leaders, we learned that he simply chose to interpret the policy so it did not conflict with Goldwater-Nichols or Title 10.

4. Business Process Reengineering

BPR is defined as the radical redesign of business processes to achieve dramatic improvement in business performance (Hammer and Champy, 2003). BPR is typically pursued to improve processes, increase productivity, reduce costs, improve customer service, and provide a competitive advantage. Continuous process improvement (CPI) is similar to BPR in that the objective is to reduce cost, improve productivity, or improve some other aspect of business operations. Both are important activities that the Air Force should pursue. However, CPI is generally associated with marginal changes, rather than the radical transformations sought in BPR.

Achieving the goals and objectives of BPR often requires business transformation enabled by IT. The implementation of IT is not the objective of the BPR activity, however; conducting BPR before identifying an IT solution is considered a condition for ERP success (Esteves, Pastor, and Casanovas, 2002).

Conditions for Success

For BPR to succeed, a number of common challenges must be overcome, including garnering senior leadership support, performing OCM,[1] articulating processes, and dealing with multiple cultural and environmental contexts. The most critical challenge to overall project success is not technical; rather, it involves the human and behavioral aspects of OCM (Somers and Nelson, 2001). It naturally follows that the conditions for BPR success most cited in the literature focus almost entirely on mitigating resistance to change. We discuss the most commonly cited conditions for success.

Leadership Support

Effective BPR and the process of change begins with top management support and communication of the vision, goals, motivation, and importance of the BPR project, which are encapsulated into the developing business case, to the stakeholders. Once the goals and vision have been established, *empowered* decisionmakers who can make binding calls on their communities must be identified. These individuals will be responsible for the day-to-day decisions required to carry out the BPR effort and achieve the identified goals. Senior leadership, middle management, and support staff must have sufficient knowledge of BPR to establish realistic goals and objectives for the BPR activities. Realistic expectations include the timeframe for BPR activity (Stoica, Chawat, and Shin, 2003).[2] Those involved should know what BPR is, how it can be used, and what can be achieved through BPR activities. If necessary, investment in

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[1] See Chapter Five for a definition and discussion of OCM.

[2] According to M. Stoica, N. Chawat, and N. Shin (2003), a typical BPR project can last between one and two years.

BPR training and resources, which may include consultants, may be pursued. However, the agency should have adequate resident expertise to oversee and manage contractor BPR activities (U.S. General Accounting Office, 1997).

Organizational and Incentives Structure Supporting Cooperation and Communication

It is critical that the organizational and incentives structure support a cooperative environment that fosters communication, confidence, and trust (Abdolvand, Albadvi, and Ferdowsi, 2008).[3] One of the key activities in BPR is establishing a common understanding of the way that work is currently being performed across the organization. We refer to this activity as the documentation of the AS-IS processes. This activity would detail the responsible entities, information flows, and activities performed for each process. Another key activity is the identification and development of areas where process could be improved, to produce a vision of the desired TO-BE process. Documenting the AS-IS and developing the TO-BE processes involves individuals sharing information that could suboptimize a local process for the betterment of the enterprise. For example, if two functional areas were individually implementing separate accounting processes to optimize their individual areas, it could make the enterprise less efficient due to additional steps to reconcile financial information. If the accounting process were shared by the functionals, they might become less efficient while the enterprise improves its overall efficiency and transparency. Both these key activities require a significant level of trust and communication, as well as a belief that achieving the long-term goals and objectives of the transformation are more beneficial than the short-term costs.

Minimize Unnecessary Customization

Once a decision is made to pursue a materiel solution, a fit-gap assessment is performed to identify how well IT implements desired processes. When a gap is identified, either the software can be customized or the organization may decide to change its processes. It is considered best practice to adapt business processes, rather than customize the software, in cases where the processes incorporated in the software support the enterprise objectives. This is because customizing the software can minimize the intended benefits of the COTS product, and has an associated cost.

Challenges

The Air Force faces a number of challenges to achieving these important conditions for BPR success. The challenges associated with mitigating resistance to change, one of the most important conditions for BPR success, are discussed in Chapter Five. The challenges associated with establishing a governance body that is critical to driving BPR activities are discussed in

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[3] See Abdolvand, Albadvi and Ferdowsi (2008) for a comprehensive assessment of organizational readiness to perform BPR.

Chapter Three. Other challenges associated with achieving conditions for BPR success are described here.

Discussions with program managers and Air Force ERP stakeholders have confirmed the findings of a 2011 GAO report that asserted the Air Force has suffered from an "immature Air Force (Business Enterprise Architecture [BEA]) and strategy" (GAO, 2011).[4,5] This has hindered evolution and convergence of financial, logistics, and human resources systems and processes and has resulted in program decisions that require changes to other ERP systems. These changes affect program schedules and cost.

An additional challenge is a lack of understanding of business processes at the enterprise and program levels. The organizational structure of the DoD and Air Force produces individuals with knowledge of how work is accomplished within a specific area, but who often lack an understanding of how their part of the process fits into a larger process. Efforts to map end-to-end processes have required significant participation of a number of individuals from various domains for extended periods of time.

The Air Force has had difficulty in driving business process change and minimizing unnecessary customization. This is partly because of resistance to change and the lack of an effective mechanism or process to foster cross-domain tradeoffs, except for individual cases of motivated senior leadership.[6] This includes a lack of governance to adjudicate BPR/process changes across the business enterprise. A lack of leaders, at all levels, who can make decisions that are binding on their communities has also hindered business process change.[7] Additionally, some regulations and policies that levy requirements to interface with external systems drive customization of Air Force ERP systems.[8]

Exacerbating these problems for the Air Force is the lack of a systematic approach to get from the AS-IS processes to desired TO-BE processes. While many methodologies have been developed over the past two decades that describe BPR activities on a strategic and tactical level, specific operational details on how to get from the AS-IS to the TO-BE processes are sparse.

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[4] An architecture is a formal blueprint for methodically and completely defining an organization's operational processes and enabling environment (U.S. Air Force, 2011b).

[5] This report by GAO concludes that while the Air Force "has a long-standing effort to develop and use an enterprise structure, they have much to do before their efforts are considered mature."

[6] The logistics financials were initially to be part of the Air Force's financial ERP, DEAMS. When it was discovered that the design for ECSS would require significant customization in order to transfer the necessary data between ECSS and DEAMS, the decision was made to include them in ECSS. This decision had to be made by the logistics and financial functional leaders, instead of being driven by an Air Force business strategy.

[7] In the Air Force, responsibility for doing BPR is currently shared by both the PMO and FMO. However, documentation of the precise roles and responsibilities could not be identified by the RAND research team.

[8] In the private sector, the ERP will replace as many systems as possible to leverage the ERP capabilities for end-to-end processes. In the DoD, the ERP may only be implemented within a certain functional domain. This requires additional interfaces to be created. For example, ECSS has the capability to do electronic invoicing, but the Air Force must use the Defense Contract Management Agency's Wide Area Workflow system to handle electronic invoicing.

Summary

BPR is pursued to achieve business improvements, and may be enabled by IT. It is considered a critical success factor to ERP implementations, and it helps an organization understand its current business processes and where improvements to the business process can and should be implemented. For BPR to succeed, top management must support the initiative and communicate the goals and objectives of the BPR activity. Senior leadership, middle management, and support staff must have sufficient knowledge of BPR; and the organizational and incentives structure must support a cooperative environment that fosters communication, confidence and trust. However, the Air Force has faced a number of obstacles in achieving these conditions for success, including the lack of an overall strategy with respect to business transformation, process change, and minimizing unnecessary customization, as well as documenting the AS-IS and developing the TO-BE processes.

5. Organizational Change Management

As has been discussed, transformational efforts, including those associated with ERP system implementations, typically affect a large number of organizations and processes. While change in general can be difficult to navigate, the tension and disruption involved in a business transformation and ERP implementation are somewhat unusual. For example, the integration, transparency, and process-oriented management enabled by an ERP system are often highly valued by top-level leadership, but can be at odds with an organization's structure, processes, and culture. This is particularly true for hierarchical organizations structured around independently operating, or stovepiped, business units, as is the case with the military services and most defense agencies (Gulledge and Sommer, 2003). An ERP implementation and associated transformational activities can also be seen as unwelcome intrusions and disruptions to mission objectives by managers and employees in general. Not only can there be apprehension regarding the time and effort needed to learn to use the new system and associated processes, but early planning activities themselves require significant time and effort from key personnel.

For these reasons, transformational efforts, especially those associated with an ERP implementation, can be met with apathy, skepticism, and resistance at all levels of the organization. Numerous past failures of DoD ERP implementation attempts have only intensified the expected skepticism and apprehension regarding current transformative ERP efforts across the defense community. Without active support of the community, these activities will fall short of realizing the desired benefits—at best—and fail, at worst. OCM is a term used to describe an organization's efforts to garner support for changes, and encourage their adoption. Our literature review found OCM to be one of the most important factors for successful ERP implementations (Finney and Corbett, 2007; Somers and Nelson, 2001), but one that has at times been underappreciated (GAO, 2008).

Conditions for Success

OCM initiatives can involve both formal and informal tactics; however, the overall OCM strategy should be a formalized, well-defined, and high-priority part of the overall transformation.[1] OCM activities need visible support from the highest levels of leadership and should be synchronized with the business case in order to be fully effective. Specific activities include stakeholder analyses, formal and informal communication, education, and training. These should target and involve all levels of the organization throughout all phases of the effort (Abdinnour-Helm, Lengnick-Hall, and Lengnick-Hall, 2003).

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[1] Several consulting firms and systems integrators have developed their own frameworks and methods for developing OCM strategies. These strategies are widely used in both the public and private sector.

Active Leadership Support

The importance of strong leadership support during any transformational effort is underscored by the vast body of literature on the topic and comments made by those we interviewed (Somers and Nelson, 2001; Jarvis, 2004; Lopez-Estrada, 2006; Finney and Corbett, 2007; Panorama Consulting Group, 2010; Defense Business Board, 2011). As one OCM lead from a DoD ERP program stated, "Organizational change management is not just propaganda and factsheets. It's the senior leaders' message from the highest level to the troops that matters."

Synchronization with the Business Case

OCM and business case development and use should be closely coordinated, as has been mentioned above. According to Poti and Kamalanabhan (2009) and many other authors contributing to OCM and ERP literature, an informed understanding of objectives and rationale on the part of employees makes the management of change much easier. Framing goals and objectives in the business case in a way that considers organizational values and culture will be more likely to encourage deep support and commitment than technical goals without a clear connection to organizational values (Ostroff, 2006). Lastly, the business performance metrics identified in the business case can be used to demonstrate early successes and will likely be more persuasive than metrics that demonstrate only technical improvements (Russell, 2006). The usefulness of this best practice was demonstrated in data improvement efforts for the ECSS program, where middle-management support was fostered through the demonstration of business improvements *independent* of system deployment.

Stakeholder Analysis

One of the first activities to take place under the OCM strategy should be a stakeholder analysis, which provides awareness of the beliefs, priorities, and equities of all internal and external stakeholders. This awareness will achieve the following effects (Ward and Daniel, 2006):

- reveal organizational "sticking points" to be monitored throughout the transformation (e.g., stakeholder groups with a high "pain-to-gain" ratio)
- enable the necessary tailoring of communications, education, and training[2]
- inform the feasibility of achieving desired benefits
- inform the best strategy for achieving desired benefits.[3]

Negative sentiments in one community can easily spread across others, potentially undermining the effort. It is therefore important to identify and consider beliefs, priorities, and equities of all stakeholders early on. The first stakeholder analysis should be completed before the finalization of the business case (Ward and Daniel, 2006). The analysis should then be updated periodically

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[2] The tailoring of OCM activities has been found to be important by several researchers (Abdinnour-Helm, Lengnick-Hall, and Lengnick-Hall, 2003; Ward and Daniel, 2006).

[3] For example, some ERP consulting firms recommend that roll-outs begin within organizations that are ready and eager and that will more easily adopt the system. Beginning roll-outs with these organizations will allow for early demonstrations of success, which will build momentum and support for the initiative.

as key decisions are made that change the trajectory of the effort. The decision to pursue an ERP system as part of business transformation would be one such decision requiring an update to the stakeholder analysis.

Employee Involvement

Keeping employees from all levels of the organization involved throughout the effort will facilitate the discovery of issues unforeseen by management and will increase buy-in among the community (Wagner and Antonucci, 2004; Sommer, 2006; Poti and Kamalanabhan, 2009). Individuals from different echelons will see the effects of proposed changes from different perspectives. Also, involvement will reassure employees that their perspective is valued and will not be ignored. Finally, simple exposure to, and direct experience with, newly proposed ideas may also breed comfort and enthusiasm within the community (Abdinnour-Helm, Lengnick-Hall, and Lengnick-Hall, 2003).

Communication

Consistent, two-way communication should also begin as early in the transformational efforts as possible to establish an understanding of the key objectives, eliminate apprehensive speculation, provide exposure to new ideas, and manage expectations (Bearing Point, 2004; Russell, 2006; Phelan, 2007; Panorama Consulting Group, 2010). This communication should begin from the top of the organization and eventually flow from multiple channels and voices.[4] Regardless of the delivery vehicle, the objectives and vision as defined in the business case should provide the major focus of communications. As the project evolves and decisions are made, messages may become more detailed but should not stray from this central focus (Fernandez and Rainey, 2006; Ward and Daniel, 2006). Where possible, enterprise benefits and changes should be translated to a "lower level" so that employees understand how their jobs may be affected (King and Brook, 2007). It should be clear to the community at large that leadership is aware of any potential "disbenefits" and will work to compensate for them (Sarker and Lee, 2003; King and Brook, 2007). Lofty goals should be communicated to challenge employees' thinking as they carry out transformational activities, such as BPR (Ostroff, 2006). However, promises made regarding immediate benefits or, when applicable, system performance should not set expectations unreasonably high.

As part of the communications effort, the community at large should be given the opportunity to provide feedback and ask questions, because this will allow for better awareness of issues unseen by management and will give employees a sense that their concerns are seriously considered (Kirchmer, 2006; King and Brook, 2007).

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[4] Examples include informational websites, Q&A sessions, staff meetings, fact sheets, and general announcements, among others.

Education and Training

In any transformational effort, education and training will be needed throughout the process and should address more than just use of a new IT system. For example, education and training will be required for individuals who will be involved in planning transformational efforts *before* the onset of those activities, as well as during them (Panorama Consulting Group, 2010). In fact, OCM in general is often cited as a critical success factor for BPR (Somers and Nelson, 2001; Abdolvand, Albadvi, Ferdowsi, 2008). Also, top-level leadership needs to be educated on the nature of any proposed technological solutions in order to gain a better understanding of where and why their involvement and support are necessary.[5] Additionally, individuals may need training in the knowledge and skills to perform new processes.[6] Finally, it is important to provide adequate user training and help-desk support as technological solutions are introduced.

Challenges

Despite general awareness of OCM's importance in ERP implementations, Air Force ERP programs have struggled to overcome organizational challenges for several reasons. Some stemmed from the structure of the institution itself, which poses serious, though not insurmountable, obstacles. The teams chartered to guide OCM efforts faced—and some still face—a difficult task. However, there were areas in which improvements could have been made, many of which would have required more resources.[7]

Stovepiped Organizational Structure and Culture

The Air Force's stovepiped structure and culture have not easily enabled or embraced key ERP planning activities aimed at improving processes. Competing interests and initiatives across functional stovepipes have, at times, kept one functional part of the organization from optimizing enterprise business processes or sharing scarce resources to support the initiatives of another. Our discussions with FMO staff in at least two programs revealed that cultural challenges hampered process-planning activities. For example, during process planning activities, there was a tendency to confuse current business processes with the purpose of these processes (e.g., some had a hard time generalizing a statement such as, "submit form XX-YY" to the more appropriately stated, "submit a purchase order"). The same tendency was also revealed during training, where it was found that many employees understood their job functions at only a rote

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[5] One ERP OCM consultant we interviewed described a weekend-long retreat taken by Army leadership before the kick-off of an ERP program. This retreat was helpful in educating these individuals on potential pitfalls and best practices. A weekend retreat was necessary because these individuals were unable to find adequate time during work hours to study and discuss these issues.

[6] In order for this training to be done well, AS-IS and TO-BE processes need to be well defined and documented.

[7] Several consulting firms have provided rough estimates for OCM budgets. Most state that OCM costs should make up about 9 percent to 12 percent of the overall program costs. Given the organizational challenges present in the Air Force context, it is reasonable to assume that such costs would not be less than these estimates, which were developed within an arguably more flexible private-sector context.

level, making process training a challenge. Another cultural challenge described by functional staff related to attitudes regarding decisionmaking: Often decisions that needed to be made by top-level leadership were wrestled with for too long at lower levels. This occurred out of a fear that bringing problems to one's boss would be seen as a sign of failure. Finally, the past experience of DoD ERP programs has been generally unsuccessful and has bred some skepticism regarding new ERP programs within the Air Force community.

Leadership Turnover and Limited Options for Incentives

Two other structural challenges, high leadership turnover and limited options for incentives, are interrelated. Without a consistent vision and message streaming from high-level leadership ("above" the program manager), interest and commitment can wane throughout the transformation (Kelman, 2005). The two- to four-year rotations for senior military officers and political appointees can make maintaining this consistency difficult for the simple reason that individuals will have different ideas and goals coming into the job. Furthermore, individuals in these positions may be motivated to focus on initiatives that will show immediate benefits rather than on initiatives that will not provide benefits until after they have moved on. Current reward structures, particularly those for middle management, often incentivize performance within a particular function or community and do not encourage optimization of business performance across the enterprise level. Instead, incentives typically reward suboptimization within suborganizations. Incentives asserted to be effective in the public sector by individual experts we interviewed included the use of performance plans and reviews, promotion, and the allure of new roles and responsibilities (Oliver and Romm, 2002; Sommer, 2011).

Narrowly Focused OCM Efforts

Air Force ERP programs faced challenges in establishing and maintaining a broad scope for OCM throughout the life of the program. First, while early OCM plans may have carried the intent to target each level of the organization and all aspects of change, many of the communications over time became focused solely on the receiving community and on system performance. This narrowing of focus was generally due to limited or diminishing funds as acquisition issues arose, causing delays. Second, it was unclear whether there were concerted OCM efforts focused specifically on BPR or other process-planning activities in any of the programs. More than one individual confirmed that BPR efforts were hampered by anxiety regarding "efficiencies" and job security. This anxiety, combined with the tendency of some to confuse the mechanics of a process with its objective, often resulted in legacy processes being upheld as the best or only way to perform a particular action. Finally, a recent GAO report revealed DEAMS training for DFAS personnel did not fully address all user needs (GAO, 2012).

Stakeholder Analyses

The stakeholder analyses provided to us by FMOs included the identification of stakeholders' influence and impact on the program, but did not assess commitment or beliefs regarding the

program.[8] Stakeholder analyses were also not considered as seriously as the literature recommends in the finalization of the business case and benefits realization plans.

Unrealistic User Expectations

We found that user expectations for some ERP efforts were not appropriately managed and at times were inaccurate. Our interviews revealed that many users did not fully understand which system functionalities they would be receiving upon roll-out. In another cases, user complaints regarding system functionality and form were met with significant system modifications when they could have been handled with further education and training. Moreover, when ERP systems "went live," performance was often poorer than expected due to unanticipated incompatibilities with the Air Force network and legacy data. Delays in acquisition schedules due to these issues and in general have resulted in loss of interest and enthusiasm at all levels of the organization. Miscommunications and misunderstandings between the PMOs and FMOs in multiple programs hindered efforts to coordinate acquisition and OCM activities to troubleshoot these problems. This lack of coordination at times led to the dissemination and use of outdated OCM material, such as training and communication materials.

Summary

Managing the elusive and constantly changing organizational challenges during business transformation is a tall order and has been a challenge for the Air Force, but there is reason to expect success in the future. The DoD now has experience with ERPs and much has changed since it first pursued ERPs decades ago. First, people in general are more used to technology. Second, the Air Force community has had ample time to acclimate to the idea of ERP systems. Lastly, today's ERP systems are more configurable, which may mean adopting organizations will be forced to make fewer trade-offs between customization and painful organizational changes. These factors may make changes easier for the Air Force community in future transformational and technological endeavors.

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[8] Conversations with the AF-IPPS FMO revealed that, despite efforts to receive more OCM funding, their two-person Strategic Outreach Office (their version of OCM) does not have sufficient resources or manpower to conduct such a stakeholder analysis.

6. IT Acquisition

In all but the rarest cases, technology should not drive business system selection. Any of the technology alternatives discussed below can be made to work given sufficient time and resources. However, some are better suited to achieving particular organizational objectives than others. Therefore, clear thinking about enterprise goals, constraints and expectations in the initial planning stages is crucial. Once these goals and expectations are set, they should be consistently reinforced through communication, acquisition activities, metrics, incentives, and governance to develop shared commitment of all parties.

Conditions for Success

Once the enterprise objectives have been decided upon and communicated, and initial BPR has been done, planning for the enabling IT can begin. The selection of the IT system and its implementation strategy should flow from, and be consistent with, the business case. This linkage should guide the many decisions that must be made during development and deployment. We will discuss some specific issues that must be carefully weighed.

System Scope

One of the first considerations in developing the architecture for the system solution is the number of functional or organizational boundaries that will be crossed. While crossing these boundaries is one of the defining characteristics of a true end-to-end process, complexity, and thus risk, typically increase with the number and diversity of these boundaries. While these challenges can be addressed through effective governance and management, they should be given serious consideration during program planning and actively monitored by enterprise leadership during execution.

Functional Domain

A system for a well-structured domain (e.g., supply) will be simpler to develop and implement than one for a more complex domain (e.g., maintenance). Complex domains will require more effort in the pretransformation phase to fully specify the AS-IS processes, and more coordination is needed in the pre- and post-program initiation phases to develop TO-BE processes that will meet or exceed the business objectives. Complex processes will also likely require more objects pertaining to reports, interfaces, conversions, and extensions (RICE).[1] For these complex domains, the potential benefits of greater integration should be realistically weighed against the challenges.

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[1] RICE objects refer to modifications to the standard ERP software functionality to meet specific customer requirements.

Legacy/Trading Partner Systems

In the case of ERP systems, one aspect of planning cited by a number of interviewees as being done inadequately was the assessment of the existing systems that would interact with, or be replaced by, the new system. The functionality, data structures and sources, users, performance, reports, and analytic capabilities of the existing system(s) should be documented and available to the development, BPR and OCM teams. Similarly, the characteristics of external systems that will interact with the ERP, particularly their interface requirements and any planned modifications, need to be understood by the ERP team. Since interfaces to external systems can drive costs and schedules, the number of these systems and owners can add complexity and risk.

Characteristics of AS-IS Environment

While an accurate characterization of the AS-IS processes and environment is most important as a baseline for the business case analysis and as a point of departure for the BPR activities, it is also useful for the selection and design of the technology solution. Costs and limitations of existing systems and processes need to be understood to support accurate assessment of alternatives. From a system development perspective, the most critical aspect of the AS-IS environment is the nature, volume, and quality of the data. Often the existing databases have many missing or incorrect entries, which are bypassed or ignored since they may not be necessary for the AS-IS process.[2] However, an ERP system, with its high degree of integration and extensive data manipulation capabilities, depends on authoritative data. Because data quality is so important to establishing confidence in the system, ERPs have data validation processes built in. Undiscovered problems with data have resulted in massive problems when systems "go live." While many were initially assumed to be errors within the ERP, further investigation revealed previously undiscovered or underappreciated problems with the source data. Correcting these problems can require substantial time and effort, but is much less disruptive if done in advance.

Technology Alternatives for TO-BE Environment

There are a variety of IT system alternatives for modernizing business systems. Each should be fully evaluated against the enterprise goals and constraints specified in the business case. While we describe discrete alternatives below, many private- and public-sector organizations have found that some combination of them may provide the most advantageous solution for a particular situation (Michael, 2012).

Legacy System Retention/Modification

The most obvious alternative is to retain or modify the existing system or systems. Whether this is a competitive option will depend on several considerations:

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[2] In one case, pre-implementation testing showed that as much as 80 percent of the legacy data would be rejected by the ERP system.

- **Functionality:** How well does/can it meet local and enterprise requirements?
- **Priority:** How critical is the function? Is the system performance adequate for the near-term? How expensive will it be to make any necessary modifications?
- **Flexibility:** How easily can the system be adapted to accommodate changes in requirements, organizations, and its operating environment?
- **Interfaces:** How many and how complex are the interfaces with other systems?
- **Maintainability:** What are the costs and availability of appropriate skills, tools, and documentation to support system maintenance? Is the system sufficiently modular to support cost-effective modification and testing of components without involving unrelated parts of the system?

Specialized Off-the-Shelf Applications

Another alternative is to use or adapt an "off-the-shelf" application, either developed by a commercial firm (COTS) or by another government organization (GOTS). If developed by a vendor to provide specialized functionality and embraced by a variety of customers, it is often referred to as "best of breed." We summarized the advantages and disadvantages of COTS and GOTS in Table 6.1.

Table 6.1. Specialized COTS/GOTS Advantages and Disadvantages

COTS/GOTS Advantages	COTS/GOTS Disadvantages
- Suitability to its intended purpose is usually high because of its focus on specific functions. - Can be implemented relatively quickly because little or no new development is required. - Cost can be lower than other modernization alternatives because the development (and in some cases the maintenance and upgrade) costs are amortized over a larger user base.	- Off-the-shelf functionality may not meet all the organization's requirements. (Modifications to a proprietary system can be expensive and may not be supported by the vendor.) - At some point, vendors will stop supporting older versions of their software, forcing customers to upgrade to a newer version. - Operating a variety of systems complicates IT operations in areas such as interface development and testing, system maintenance, user training, and help desk functions.

ERP

ERP systems present some compelling advantages over other alternatives for modernizing today's DBSs, as indicated in Table 6.2.

Table 6.2. ERP Advantages and Disadvantages

ERP Advantages	ERP Disadvantages
• Integrates a wide range of related business functions into a single system using common data. • Incorporates "best" (or at least most common) practices for each of the core functions. • Structured around end-to-end business processes rather than individual functions thus streamlining performance. • Can serve as a forcing function for transformation (assuming active commitment by leadership). • Requires disciplined approach to process and data definition, encouraging rationalization and consistency. • Can replace multiple systems simplifying cross-functional transactions, communication, analysis. • Sustainment is simplified by common system and data across multiple organizations and by vendor-provided support. • Training is simplified by common user interfaces. • Can be implemented, at least in theory, with less development risk and in less time than most alternatives of similar scope, assuming it is treated as a COTS product. • Continuing vendor support and upgrades reduce Lifecycle Cost/IT staff workload.	• Realigning processes to match the software requires substantial effort and cooperation across affected entities, which are often underestimated. • Modification to add unsupported capabilities (as opposed to configuration of existing functionality) can be expensive and time consuming, both during implementation and sustainment. • Requires specialized expertise to design and implement the system efficiently and effectively. • Commits the organization to a proprietary solution.

Custom Development

Custom business systems range from locally developed ad hoc software for specialized applications to centrally managed systems in common use across the Air Force or DoD. Until fairly recently, this was the default approach to obtaining IT capability in DoD. However, the proliferation of these custom systems has resulted in an increasingly complex and expensive operational and sustainment environment. The services, OSD, and Congress are all taking actions to reduce duplication and inefficiencies by increasing visibility and centralizing approval for new systems. However, in situations where process requirements are highly specialized, custom software may still be the appropriate choice. Table 6.3 summarizes the advantages and disadvantages of custom development.

Table 6.3. Custom Development Advantages and Disadvantages

Custom Development Advantages	Custom Development Disadvantages
• High suitability to purpose. This is particularly true where other options involve unacceptable compromises, because of mission criticality and/or unique requirements. • Simplified governance/decisionmaking (assuming more limited scope than ERP and crossing fewer organizational boundaries).	• Higher cost and risk than COTS/GOTS. • Often leads to inefficient duplication of capabilities and resources across organizations. • Can complicate current and future transformation/integration. • Requires tailored sustainment. • Upgrades/modifications typically expensive.

SOA

Service-oriented architecture (SOA) is not a technology but an architectural approach characterized by a set of standards that allow independent services to be discovered and accessed over a network through standard protocols (typically Web services). These services can be combined by users in various ways for various purposes. Since their structure, platform, and operation are isolated from users of the service, they can be developed and maintained independently. The result is a distributed heterogeneous architecture using shared services that functions based on common protocols. Table 6.4 summarizes the advantages and disadvantages of SOA.

Table 6.4. SOA Advantages and Disadvantages

SOA Advantages	SOA Disadvantages
• Provides architecture and data standards enabling multiple applications to use shared services and data. • Can be used with any of the alternatives discussed above. • Can extend the useful life of legacy systems and allow for phased modernization. • Allows for decentralized development/modification of components. • Can provide increased flexibility to adapt to changing requirements or conditions.	• Not necessarily transformative.[3] • Requires effective governance for architecture, standards and enforcement. • If components are not used by a variety of applications, then economies are reduced or eliminated. • Span time for phased modernization delays the modernization process substantially. • Requires legacy systems/components to be brought into compliance with SOA standards.

Availability of Qualified Personnel

Specialized expertise is needed to implement these systems. This is particularly true in the case of ERPs, where enterprise priorities must be communicated and reinforced, the interests of

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[3] An SOA approach is not a forcing function for business process transformation because it does not attempt to dictate the internal operation of the components or their uses as an ERP would. If the objective is incremental improvement of the AS-IS processes, SOA can accommodate that as long as the required protocols are observed.

various stakeholders must be harmonized, complex processes must be redesigned, and the workforce must be motivated and retrained. Experienced outside advisers may be needed to help evaluate competing claims, frame implementation choices, and assist in planning to minimize unintended consequences. Several programs noted the advantages of having independent advisers in addition to the implementing contractor, supplemented with personnel from the software vendor. Finally, the incentives of these contractors must be aligned with program and enterprise goals through a combination of selecting appropriate firms, active management, and contractual incentives.

Challenges

In addition to the challenges common to all ERP implementations, there are some that are more specific to the DoD environment.

DoD ERP programs tend to have many requirements and constraints related to their public-sector environment and their national security mission. Although there is (or should be) considerable commonality across the business operations of the DoD components, there are also unique requirements driven by individual service missions and environments that may preclude complete standardization of systems and processes. These unique requirements should be challenged and validated, but should not be assumed away during the planning phase.[4] Another example is that the normal approach for delivering ERP capability in efficient, useful increments may have to be modified to meet external requirements such as service or DoD enterprise goals (e.g., auditability or impending retirement of legacy systems) and constraints imposed by the DoD acquisition, funding, and certification processes. Several programs also noted that limitations of the IT hosting environment can degrade business system performance substantially. These limitations were often not discovered until after system deployment.

The skill set and specialized knowledge required to design and execute a successful ERP implementation are not widely available within most DoD (or commercial) organizations. General experience in various aspects of IT or DoD functional processes, while useful, is not sufficient for the unique challenges of ERP. Personnel with in-depth knowledge of the business processes involved, BPR, the specific version of the selected software platform, and the complexities of implementing an ERP in a large public-sector organization need to be part of the ERP team. Failure to ensure they are actively involved increases execution risk dramatically. If this expertise will be provided by contractor support, personnel responsible for source selection must critically evaluate the offeror's expertise and track record of delivering ERP-relevant capability in similar circumstances.

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[4] For example, many world-class companies use commercial software systems for generic business operations but rely on custom software for the critical functions that provide them with a competitive edge (Vogels, 2006; Soh, 2005).

Summary

There is a natural tendency to focus prematurely on the candidate IT products themselves, before more fundamental enterprise considerations have been articulated and decided upon. In the case of ERPs, this is largely due to the undeniable appeal of an off-the-shelf solution that purports to provide "best of breed" functionality—at lower development, training, and sustainment costs; within a shorter timeframe; and at lower risk because the system has been developed and deployed for other users. ERPs are also seen as a vehicle for rationalizing and streamlining business processes. Unfortunately, realization of these benefits is far from automatic and requires substantial planning, expertise, and commitment from all stakeholders.

In addition to these challenges, which are common to all ERP projects, there are constraints peculiar to the public sector, such as consensus-based decisionmaking, highly constrained source selection and acquisition management processes, the size and scope of government operations, and the lack of direct enterprise level metrics, which make implementing these systems even more challenging.

7. Summary and Recommendations

In this report, we have defined success of an ERP-enabled business transformation as the realization of business benefits aligned with enterprise goals, within designated cost and schedule constraints. This could become increasingly important to the Air Force as today's fiscally constrained environment further drives the need for increased efficiencies and savings. As noted in the introduction, the conditions to realize success apply to both the private and public sectors. But the Air Force faces challenges that increase the difficulty of achieving these conditions. Based on RAND interviews and literature reviews, the fundamental motivation for undertaking an ERP acquisition is to enable business transformation.

A summary of the key conditions for success, challenges to meeting these conditions, and recommendations to mitigate these challenges are described below.

Key Conditions for Success

Overall

- An Air Force enterprise business strategy supports the operational priorities of the Air Force; outlines the business enterprise goals and objectives; describes the principles, goals, and objectives that are the foundation for an Air Force Business Enterprise Architecture; is the framework for cross-functional decisionmaking and adjudicating touchpoints between functionals; and should provide the foundation for any business transformation.

Business Case

- There must be a clear understanding of AS-IS environment and of how the desired TO-BE environment achieves enterprise goals. These should be documented in the business case.
- The business case should articulate the business benefits and eventually include all associated costs, risks, and a realistic schedule.
- All of these steps should be completed before implementing the preferred solution, so that the final document can inform both the enterprise's decision to commit resources to carrying out the transformation and its selection of a preferred solution.

Governance

- The governance structure and related decisionmaking criteria should be grounded in the business case.
- Governance should be as simple and responsive as possible with clearly defined authority and roles and responsibilities.
- Ideally, the process should be led by a single person if possible, or a small group.
- Air Force senior leadership should visibly support all governance.

Business Process Reengineering

- BPR activities should be conducted in support of the business strategy and should, predominantly, be planned and performed prior to any technology implementation.
- BPR depends on the business case for its focus and should drive the enterprise's processes toward achieving the benefits articulated in the business case.
- BPR participants should seek to achieve the desired benefits through process changes and avoid unnecessary customization of the technology solution to reflect legacy practices. Decisionmakers and participants should maintain an enterprise view and optimize it even if it means suboptimizing a particular functional area.
- Decisionmakers and participants should have sufficient understanding and expectations regarding BPR and what it can accomplish.

Organizational Change Management

- OCM, a key transformation enabler, should be well thought out, appropriately coordinated, and provided with adequate resources. It should include planning and implementation activities with well-defined implementation strategies.
- While there are formal processes for OCM, they should be tailored to the specific transformation and audience.
- OCM is the communications, education, and training avenue for the transformation, with the business case providing senior leaders the framework to provide a clear, consistent message.

IT Acquisition

- If and when it is determined that an IT acquisition is required, the full range of potential alternatives should be evaluated against their ability to achieve the benefits stated in the business case.
- Should an ERP prove to be the appropriate solution, specific expertise in this technology should be assigned to the program, either organically or through contractors and individual subject-matter experts who have proven expertise in similar engagements.
- Careful attention should be paid to tailoring contractor incentives and motivating them to help achieve the enterprise objectives specified in the business case.

Key Challenges

Overall

- Historically, there appears to have been little, if any, overall Air Force-level business strategy as described above; i.e., providing the enterprise vision for development of a business case, the foundation for governance, BPR, OCM, and IT acquisition.

Business Case

- In general, the existing business cases do not appear to capture benefits and enabling changes with sufficient detail before commencement of IT acquisition. This is due, in large part, to a poor understanding of the AS-IS environment (i.e., processes, costs,

performance) and supporting analyses. This absence of detail undermines the rigor with which benefits, cost, schedule, and risk are assessed in the business case.

- There are disincentives to fully disclose some potential benefits (e.g., financial and personnel savings) because the functional owner may not reap them or control the resources in question. In many cases, the Air Force enterprise reaps benefits (and frequently collects them before realization), putting the functional at risk.

Governance

- The Air Force organizational structure makes it challenging to oversee and implement enterprise solutions. The Air Force has both the SECAF responsible for "business" and the CSAF for "operations/command"—with these being further subdivided into functional stovepipes. This sort of hierarchy can increase the numbers of stakeholders, driving more complicated governance structures and reducing efficiency and effectiveness.
- Public-sector governance has oversight dictated by law with mandatory compliance—or, in the case of regulations and policies, waiver requests.
- Within the public sector, senior leader turnover is the norm with political appointees and senior officers rotating regularly. This can result in uncertainty in the transformation, with critical decisions being delayed or deferred to incoming leaders or past decisions being revisited by new leadership with different priorities.

Business Process Reengineering

- The absence of an overarching business strategy has hindered the evolution and convergence of financial, logistics, and human resources systems and processes. As a result, decisions affecting multiple functionals are not coordinated and adversely affect cost and schedule.
- The Air Force has had difficulty in driving business process change and minimizing unnecessary customization. This is partly because of resistance to change and the lack of an effective mechanism or process to foster cross-domain tradeoffs, except for individual cases of motivated senior leadership. Additionally, BPR is constrained by laws, regulations, and policies that can limit opportunities to change processes in lieu of COTS customization. For example, to preserve a functional investment in a particular system, a policy may require an interface to the existing system instead of a more efficient approach using the functionality already available within the COTS product.

Organizational Change Management

- The large number of stovepipes in the Air Force organizational structure makes achieving buy-in to a single solution difficult. All stakeholders must be willing to suboptimize when necessary for the good of the enterprise.
- OCM is narrowly focused or mistimed. For example, at times there was over-emphasis on communication and training related to system deployment without thorough orientation or training for earlier planning activities, such as BPR. At other times, new capabilities were advertised too far in advance of technology deliveries due to delayed acquisition schedules. Lack of communication, or miscommunication, between the FMOs and PMOs prevented effective mitigation of these issues.

- Stakeholder analyses are not always robust and are not considered seriously enough in the finalization of the business case and benefits realization plans.

IT Acquisition

- DoD ERP programs don't lend themselves to generalized solutions because each presents different opportunities. Moreover, if an IT acquisition is pursued, it is frequently subject to constraints related to service missions, national security requirements, and the laws, regulations, and policies imposed by higher-level organizations. This has the potential to drive the phasing of program activities, the number of interfaces, and a variety of other aspects of program execution, thereby increasing complexity—and ultimately, program cost and schedule.
- Some IT acquisitions require specialized skill sets to develop and implement effectively. An ERP is one such example. As they are relatively few in number with extended implementation schedules, these may occur "once in a career" and do not lend themselves to development of widespread or deep organic expertise.

Recommendations

Below we present our recommendations for mitigating the above planning challenges in three time phases: *Pretransformation*, in which the initial conditions for transformation are established; *Transformation, Preprogram Initiation*, in which all the activities leading up to a materiel decision are performed; and *Transformation, Post-Program Initiation*, in which activities following the decision to pursue an IT acquisition are carried out. Our challenges and recommendations are summarized in Table 7.1.

Table 7.1. Summary of Challenges and Recommendations

Challenges	Recommendations
- Lack of an overall Air Force-level business strategy that is endorsed by both the business (SECAF) and command (CSAF) sides of the Service.	- The Air Force CMO (USECAF) should establish an Air Force business strategy, jointly maintained and promulgated with the VCSAF.
- Limited understanding of AS-IS environment and early supporting analyses preclude business case rigor before IT acquisition.	- Document an integrated AS-IS environment at the Air Force enterprise level. This provides the baseline for functional strategies and transformations, and ensures coordination across functions leading to integrated solutions. - With the AS-IS baseline established, develop metrics to measure progress toward the TO-BE environment. Benchmarking, simulation, and even small pilot programs can help develop these metrics. - Link benefits with specific changes to business processes, organizations, and IT to improve the business case's foundation. This would foster a complete consideration of benefits, costs, and risks.
- There are disincentives to articulating benefits and reporting their realization (e.g.,	- Establish accountability to the Air Force Corporate Structure for benefits realization. Use achieving the benefits in the

Challenges	Recommendations
financial and personnel savings).	funding decisions within the PPBE. • Consider benefits-sharing with stakeholders to incentivize better disclosure and management of benefit realization.
• Multiple Air Force stovepipes (functional, business, and command) inhibit timely, effective, and efficient transformation.	• The Air Force CMO (USECAF) should establish an Air Force business strategy, jointly maintained and promulgated with the VCSAF. This will provide the foundation for decisionmaking necessary to address touchpoints between stovepipes.
• Public-sector governance has oversight dictated by law with mandatory compliance—or, in the case of regulations and policies, waiver requests.	• Question rationales for management layers based on regulations and policies and reduce them to minimize the distance of the decisionmaker from the issues. This should reduce opportunities for information to be filtered, distorted, or misrepresented and increase probability that decisions are addressing the correct issue.
• Instability due to senior leadership transience impairs effective decisionmaking.	• Documenting governance authorities, roles, and responsibilities in a charter helps increase opportunity for continuity. • Make the USECAF and VCSAF co-chairs of Air Force enterprise governance. • Report benefits realization at CORONA or another executive forum, ensuring the Air Force's senior stakeholders are involved. As decisions at this level are documented, a record is maintained for continuity.
• The absence of an overarching business strategy has hindered the evolution and convergence of financial, logistics, and human resources systems and processes and has resulted in program decisions that require changes to other ERP systems.	• Use the Air Force enterprise business strategy, business enterprise architecture, to be the framework and foundation for BPR and technology decisions, including cross-functional decisions.
• Difficulty in driving changes to business process and minimizing unnecessary customization.	• Starting from the documented AS-IS processes, conduct BPR and develop TO-BE business processes before determining if a new IT acquisition is appropriate. • Question and attempt to mitigate constraints on BPR based on regulations and policies. • Use the decisionmaking criteria grounded in the business case to provide objective criteria to decide between changing processes or customizing technology.
• Competing stakeholder priorities are not aligned to goals and benefits documented in the business case.	• Use the promulgated Air Force business strategy to focus stakeholder priorities. • Explore various forms of incentives; performance evaluations, promotion opportunities, and allure of new roles have been successful in other DoD ERP programs.
• Air Force OCM often too narrowly focused, underfunded, or mistimed, leading to inaccurate or unrealistic expectations.	• Adequately fund OCM activities, and carefully schedule these activities to mesh with the transformation timeline. • Initial OCM activities focus on senior leader education and buy-in. • Later activities focus on acceptance of new technology and process/organization changes. • As key decisions are made that affect the trajectory of the overall transformation, stakeholder analyses and OCM plans

Challenges	Recommendations
	(communication, education, and training) should be updated.
• Stakeholder analyses are not robust enough and generally not considered in finalization of the business case.	• A stakeholder analysis is necessary to identify potential organizational pitfalls and the feasibility of achieving desired benefits within a proposed timeline. The analysis should be updated as the effort evolves.
• DoD ERP programs don't lend themselves to generalized solutions because each presents different opportunities, risks, and competing priorities.	• Conduct a robust AoA to assess alternative approaches to achieving enterprise objectives specified in the business case. The analyses should address appropriate system scope, functional complexity, required interfaces, data quality, and key constraints. • IT should be delivered in manageable increments considering complexity, operational priorities (e.g., auditability, legacy system retirement), implementing basic functionality before extensions, complete end-to-end processes where feasible, and coordinating with related initiatives (e.g., reorganization, replacement or upgrades of legacy systems, changes in hosting environment). • A robust assessment of data sources, structures, definitions, and quality should be conducted early on to inform both BPR and IT planning activities.
• Expertise in ERP and business processes not consistently available.	• Ensure qualified personnel are involved with the program either through assignment or contracting arrangements.

Pretransformation

- Promulgate and implement a sufficiently detailed Air Force enterprise business strategy that comprises the elements previously described and create a business enterprise architecture to be the framework and foundation for future business transformations. This also provides the framework for understanding the AS-IS and TO-BE environments. The business strategy should be developed by the CMO (USECAF), and informed and jointly promulgated by the VCSAF.[1] As depicted by the blue arrows in Figure 7.1, functional strategies should flow from the Air Force enterprise business strategy and are the motivation for the functional transformations.[2] The green arrows indicate the functional transformations that enable the associated strategies, which in turn enable the Air Force's total transformation. The orange horizontal arrows indicate cross-functional coordination and integration. The purple arrows show the connection of the enablers to the desired transformations.
- Document an integrated AS-IS environment at the Air Force enterprise level. This provides the baseline for functional strategies and transformations and ensures coordination across functions leading to integrated solutions.
- With the Air Force business strategy as the foundation, establish Air Force enterprise-level governance chaired by the USECAF and VCSAF. The business and

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[1] This complements the USECAF's and VCSAF's responsibilities (Under Secretary of the Air Force, May 2012).

[2] This would also apply to other business functional strategies and transformations not shown.

command/operations parts of the Air Force are now represented and the decisionmakers can make integrated, cross-functional decisions to optimize the Air Force enterprise.

- Provide an assessment of compliance with Air Force business strategy at an executive forum, preferably CORONA.[3] The four-star stakeholders are then directly involved in Air Force business benefits realization. CORONAs have the benefit of being existing, ongoing meetings, so discussions in this venue would reduce the impact of senior leadership turnover and increase business program stability. It also would increase accountability in implementing Air Force business strategy.

Figure 7.1. Relationship of Enterprise Business Strategy to Functional Transformation
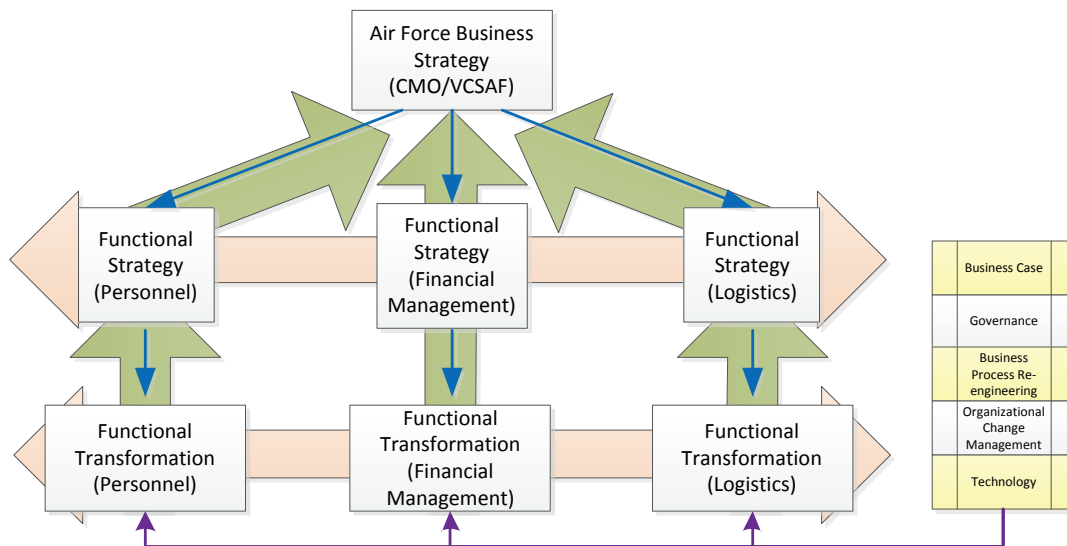
Transformation, Preprogram Initiation

- Develop a business case consistent with enterprise strategy and goals that is aligned with lower-level Air Force business and IT enterprise architectures. In building the business case, the Air Force must place a greater emphasis on expected benefits and their realization.

  – With the AS-IS baseline established, develop metrics to measure progress toward the TO-BE environment. Benchmarking, simulation, and even small pilot programs can help develop these metrics.
  – Establish accountability to the Air Force Corporate Structure for benefits realization. Funding decisions within the PPBE should factor in achievement of benefits.
  – Consider benefits-sharing with stakeholders (e.g., allowing stakeholders to retain a portion of saved funds or manpower) as an incentive for better disclosure and management of benefit realization.

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[3]CORONA meetings are held three times a year to provide a venue for the most senior leadership of the Air Force to consider important service-wide issues. These meetings are chaired by the SECAF and CSAF.

- Link benefits with specific changes to business processes, organizations, and IT to improve the business case's foundation. This would foster a more complete consideration of benefits, costs, and risks.

- Once a decision is made to go forward, develop the transformation governance structure for decisionmaking that advances the transformation goals. This needs to be done within the context of the Air Force business strategy and should be aligned with the Air Force enterprise business governance, which is responsible for advancing this strategy and should be co-chaired by the USECAF and VCSAF.

    - Governance should be documented and be based on achieving the transformation's goals and objectives as stated in the business case. This establishes a baseline with all the stakeholders early in the transformation, allowing them to take an enterprise view before more specific interests surface, and forms a foundation for decisionmaking criteria that will help guide the rest of the project toward achieving the stated goals.
    - Authorities, roles, and responsibilities must be written in an unambiguous, enforceable charter.
    - Rationales for management layers based on regulations and policies should be questioned and, where possible, reduced to minimize the distance of the decisionmaker from the issues. This should reduce opportunities for information to be filtered, distorted, or misrepresented and increase probability that decisions are addressing the correct issue.

- Starting from the documented AS-IS processes, conduct BPR and develop TO-BE business processes before determining if a new IT acquisition is appropriate. This helps ensure that process goals are clearly understood and provides definitive information to assist in determining the correct materiel solution if one is necessary.

    - Question and attempt to mitigate constraints on BPR based on regulations and policies.
    - If a new IT materiel solution is required, update the TO-BE processes and reassess benefits realization.

- OCM activities should begin once the decision is made to pursue a business transformation. These activities should be adequately funded and carefully timed to the transformation.

    - The business case provides key objectives and expected changes that leadership and OCM personnel need to communicate. The business case will help OCM personnel articulate a convincing argument for change, thus fostering buy-in and early understanding. Senior leaders need to understand where and why their involvement is required. Functional personnel involved with data-cleansing efforts and BPR should understand and internalize the business case objectives and how these specific efforts fit in the larger picture.
    - A stakeholder analysis is necessary to identify potential organizational pitfalls and the feasibility of achieving desired benefits within a proposed timeline. This analysis should assess equities and priorities of all affected stakeholders, in addition to their commitment, perceptions, and concerns with respect to the effort.

- Data quality was noted by many of our sources to be more of a challenge than originally planned for. They found that different legacy systems used different data definitions for the same or similar data, different systems needed different data, and migrating this to a new IT system took substantially more time and effort than anticipated. A robust assessment of data sources, structures, definitions, and quality should be conducted early in the process to inform both BPR and IT planning activities.

Transformation, Post-Program Initiation

- Governance, using criteria founded in the business case, should be employed to decide whether changing the updated business processes or customizing the system is more appropriate. For an ERP, literature and best practices indicate it is typically preferable to modify processes as this preserves the integrated nature of the ERP system and has less cost and schedule impact. This may not be the case for other technologies.

  – The decisionmaking criteria must be consistent from the program level to the Air Force enterprise level. With these criteria understood well, objective decisionmaking can increase the likelihood that the program will achieve the benefits described in the business case.

- Program-specific OCM should focus on achieving acceptance of the new technology and required process/organizational changes; this is frequently accomplished by providing incentives to affected personnel.

  – Middle managers' participation in planning and preparing for an ERP implementation will equip them with valuable experiences and broader perspectives on business operations. This added experience could qualify them for promotion.
  – Including an assessment of individuals' support of the new goals and objectives in their performance reviews can also be a good incentive.
  – New roles, such as the ability to manage one's own portfolio, may also help boost cooperation.
  – Some retirees, due to their knowledge and perspective, may be effective influencers "behind the scenes." If enough of these individuals support the effort, their attitudes can affect those still in service.

- As key decisions are made that affect the trajectory of the overall transformation, stakeholder analyses and OCM plans (communication, education, and training) should be updated.
- Conduct a robust AoA to assess alternative approaches to achieving enterprise objectives specified in the business case. The analyses should address appropriate system scope, functional complexity, required interfaces, data quality, and key constraints.
- IT should be delivered in manageable increments considering complexity, operational priorities (e.g., auditability, legacy system retirement), implementing basic functionality before extensions, complete end-to-end processes where feasible, and coordinating with related initiatives (e.g., reorganization, replacement or upgrades of legacy systems, changes in hosting environment).
- Effective IT implementation requires personnel with in-depth knowledge of functional operations and others with relevant technology experience. If an ERP is the desired

solution, true ERP SMEs are needed to guide its implementation due to its complexity and to meet schedule constraints. This expertise can either be organic or provided by contractors who act as trusted agents of the government and are not affiliated with the implementing vendor. Having individuals learn these skills on the job or using a rotating cast of key personnel increases cost and schedule risk.

Appendix A. Planning Activities

In this appendix, we provide a high-level summary of planning activities that must occur to successfully carry out ERP-enabled business transformation. These activities are organized in Table A.1 horizontally by temporal phase and vertically by planning area.

The Pretransformation phase represents what should take place to perform "business as usual." Many of the activities that take place during the Pretransformation phase should continue through the other two phases. Transformation begins at the point where a problem is recognized that cannot be addressed through routine management techniques (therefore requiring a transformation). Program Initiation is defined as the point where it is decided that IT acquisition will be needed to achieve transformational goals. In the Defense Acquisition System, this is the MDD milestone. Pretransformational activities do not, in many cases, fit neatly within the planning areas as described in this report. However, each of these activities roughly corresponds to a particular planning area, as depicted in Table A.1.

Planning activities are also described within the context of three tiered perspectives: enterprise view, transformational view, and program view. The *enterprise* view focuses on issues affecting the entire Air Force enterprise and is within the purview of top leadership (i.e., SECAF, USECAF (CMO), CSAF, and VCSAF). The *transformational* view focuses on issues relating to a specific transformational initiative within the enterprise, and usually corresponds to a particular functional community or command. The *program* view pertains to the IT acquisition activities that are part of the transformational initiative and are within the purview of the program's FMO or PMO.

This appendix may be helpful as a supplement to Appendix B, which is intended for use as a program assessment tool.

Table A.1. Planning Activities by Temporal Phase and Planning Area

Transformational Planning Area	Pretransformation (i.e., Ongoing)	Transformation, Preprogram Initiation	Transformation, Post-Program Initiation
ECHELON LEGEND: **Enterprise View**, Transformational View, *Program View*			

Business Case	• **Use enterprise goals and objectives articulated in Air Force business strategy to develop enterprise architectures.**
	• **Monitor external/internal business drivers and need for transformation.**
	• Maintain derived functional/command goals, strategies, and architectures.
	• Monitor external/internal business drivers and need for transformation.
		• Build business case for transformation:
		  o Identify goals; define derived benefits; and assess associated cost, schedule, and risk of alternatives.
		  o Governance, businesses processes, organization, and IT issues should all be considered.
		  o If IT acquisition needed, then submit BCL problem statement at MDD.
			• Carry out AoA to help determine preferred solution if IT acquisition is needed.
			  o Governance, businesses processes, organization, and IT issues should all be considered.
			• Summarize analyses in BCL business case and submit before Milestone A.

Governance	• **Implement enterprise governance board (co-chaired by USECAF and VCSAF).**
	  o **Decisionmaking criteria based on Air Force enterprise strategy to achieve enterprise goals.**
		• Early on, create governance board at the appropriate level to support upcoming transformation necessary to achieve enterprise goals.
		  o Use stakeholder analysis to determine the participants and level of influence.
		• Use functional/command strategy to develop decisionmaking criteria.
			• Align program governance with enterprise governance and focus program-level governance on achieving business case benefits.
			• Focus decisions on changing processes or customizing technology to support goals and achieve business case benefits.
			• *Support enterprise and transformational-level governance.*
			  o *Provide requested information to allow governance to decide between changing processes or customizing technology.*

Transformational Planning Area	Pretransformation (i.e., Ongoing)	Transformation, Preprogram Initiation	Transformation, Post-Program Initiation
Business Process Reengineering	• **Maintain cost and performance data for business operations.** • **Continually improve business processes at enterprise levels, independent of IT**. • **Develop high-level AS-IS process model.** • Continually improve business processes at functional levels, independent of IT.	• **Develop high-level TO-BE solutions.** o **BPR team and executive steering committee choose alternatives and supporting IT, if any.** • Develop and understand enterprise level TO-BE business processes, while questioning operating constraints. • Support establishment of BPR team. • Develop detailed AS-IS process model. o Develop candidate alternative TO-BE solutions. • *Work with functional/command to improve AS-IS process model.* o *Work with functional/command to develop candidate alternative TO-BE solutions.*	• *Fit-gap analysis.* • *Blueprinting.*

Transformational Planning Area	Pretransformation (i.e., Ongoing)	Transformation, Preprogram Initiation	Transformation, Post-Program Initiation

OCM	• **If a more transparent, integrated, or efficient organization is desired, work to establish a culture that values enterprise goals over stovepiped goals (may involve a reexamination of incentive-structures and policies).**
	• Train people well on job functions.
	• Educate employees on how their role fits into enterprise mission.
		• **Leadership should visibly communicate support for transformation in a way that is consistent with the vision as defined in the business case.**
		• **Top-level governance body should be aware of organizational sticking points (awareness achieved through a stakeholder analysis) and understand their role in mitigating potential issues.**
		• Begin OCM engagement with leadership on enterprise goals to support business case and BPR (includes education).
		• Perform a stakeholder analysis to determine organizational challenges.
		• As early as possible, train and communicate expectations and goals to those who will be involved in transformational efforts such as BPR, data improvement, decision groups, etc.
		• Communicate early and often with affected communities regarding goals, scope, and progress of the effort.
		• Train and educate communities on changes to take place as a result of BPR, data improvement, and other transformational efforts.
			• **Leadership should visibly communicate support for the addition of a new technology solution as part of the transformational strategy.**
			• **Top-level governance body needs to understand where and why time and attention will be needed in program decisions.**
			• Update stakeholder analysis (continue to update if major changes made to transformational objectives/plans).
			• Continue to update communications, education, and training plans, strategies, tools, and material. Updates should consider decisions as they are made and the results of the stakeholder analysis as it is updated.
			• *Focus OCM activities on acceptance of technology and associated process/organizational changes.*
			  ○ *Enabled through effective use of incentives (e.g., performance appraisals).*
			  ○ *Set and manage reasonable expectations regarding early system performance through communications, education, and training (e.g., convey that a stabilization period is normal for an ERP implementation).*
			  ○ *Coordinate closely with the PMO to ensure proper coordination and timing of OCM activities with the acquisition schedule.*
			• *Inform PMO of relevant results of the stakeholder analysis (to be considered when determining roll-out strategy, etc.).*

Transformational Planning Area	Pretransformation (i.e., Ongoing)	Transformation, Preprogram Initiation	Transformation, Post-Program Initiation

Technology Acquisition	• Document current IT baseline including functions, data, interfaces, environment, and direct and indirect costs.	• Assess data to be migrated; begin cleansing before program initiation if needed.
		• *Identify and characterize range of IT options to meet enterprise goals.*
			• *Implement system in manageable increments considering:*
			  o *Domain and organizational complexity*
			  o *Operational payoff*
			  o *Core functions before extensions*
			  o *End-to-end processes*
			  o *Related external initiatives*
			• *Expand process blueprint to fit chosen system alternative.*
			• *Identify and develop plan for providing any required functionality not available in chosen alternative.*
			• *Source selection/contract award.*
			• *Configure/develop system.*
			• *Test increment.*
			• *Conduct system training.*
			• *Migrate data.*
			• *Deploy increment.*
			• *Sustain system.*

Appendix B. Implications for Program Assessment

In this appendix, we draw upon the work in this report to formulate a set of criteria to support early program assessments. The questions contained in the following questionnaire are intended to direct the analyst to potential areas of risk or noncompliance with policy, as well as to conditions for success. These considerations are discussed in more detail in Chapters Two through Six, which we urge analysts to reference when using this assessment tool.

This list is not sequential. For a rough chronological view of activities, refer to Appendix A.

Business Case

As of this writing, DoD IT acquisition policy and guidance for the business case (including the problem statement) is summarized in the following references: Carter (2011), Defense Acquisition Guidebook (2012b), and Business Case Template (2012a). See Chapter Two of this report for a more detailed discussion of business case considerations.

- **Do the format, content, and timing of the business case (including the problem statement) comply with DoD IT acquisition policy and guidance?**

The problem statement is the front-end portion of the business case. It should clearly describe the business need and include AS-IS and initial TO-BE analyses, as well as a recommended course of action. Guidance for the format and content of the problem statement is summarized in Defense Acquisition Guidebook (2012b) and Business Case Template (2012a). It is important that the problem statement be submitted prior to MDD, as required by DoD policy (Carter, 2011), because it should inform the decision whether to pursue a materiel solution. If a materiel solution is needed, a business case is subsequently developed that builds upon the problem statement. The business case justifies the recommended course of action, of which the materiel solution is part. While the business case is a living document that is refined throughout the BCL lifecycle, it is important that the initial business case is submitted prior to Milestone A, as required by DoD policy (Carter, 2011). This ensures that the business case fulfills its purpose of justifying the investment of resources for the transformation approach, including the initiation of an acquisition program. The remainder of this appendix further helps to ensure that there is sufficient rigor in the business case. In addition to justifying the transformation approach, it helps manage the realization of the transformation benefits.

- **Are the motivating enterprise business goals identified and aligned with an Air Force business strategy?**

As explained in Chapter Two under "Conditions for Success . . . Alignment Between Enterprise Business Goals and Strategy," the importance of setting goals explicitly aligned with enterprise strategy is critical for ERP-enabled business change because it provides guidance for governance, BPR, and OCM activities involving diverse stakeholders who often have conflicting goals and priorities. Moreover, explicit alignment with an enterprise strategy fosters

compatibility and avoids duplication with other business change initiatives being carried out within the enterprise. Per DoD IT acquisition policy and guidance, the identification of business goals and their alignment with strategy are required to be included in the problem statement.

- **For each solution alternative considered, has a comprehensive set of business benefits, tied to the stated Air Force enterprise business goals, been identified?**

The business case should summarize the results of the AoA, which occurs just after MDD. The basis for the AoA, and thus for the business case, should be a comprehensive list of business benefits in addition to cost, schedule, and risk. Differentiating among alternatives with respect to benefits can be challenging, but failing to do so results in an incomplete AoA. While a comprehensive set of business benefits should be articulated, unplanned benefits can arise after the IT system is implemented and the organization better understands how to exploit it to obtain business value.

- **For each of the benefits, have the following been identified?**

  – **metric with AS-IS and TO-BE values and method of measurement; or clear criteria for evaluation for qualitative benefits**
  – **rationale and support for the realism of the TO-BE values**
  – **benefit owner, ideally with sufficient incentive and influence, to help ensure realization.**

As explained in Chapter Two under "Conditions for Success . . . Detailed Definition of Business Benefit," business benefits should, to the extent possible, be expressed in measurable terms in the business case—even using metrics requiring subjective assessment (e.g., for workforce morale)—and include AS-IS and TO-BE values and a method for measurement to help track their realization. While metrics that can be expressed in financial terms are attractive in that they may be aggregated into an economic analysis along with project costs, the importance of nonfinancial benefits for IT systems, such as ERPs, should not be discounted; they, too, can provide significant business value. Note that providing values for metrics entails an understanding of both AS-IS and TO-BE performance and cost, which may require simulation/modeling tools, benchmarking, or pilot implementations if the underlying benefit entails a new activity (Ward, 2006). While analyses underlying the AS-IS and TO-BE values would not be included in the business case, such analyses should be made available to the analyst to verify the accuracy, realism, and rationale of the stated metric values.

Each benefit should also have an "owner" who is responsible for its realization. Ideally, a benefit owner will be an individual, but can also be a small group of individuals, who receives the benefit and therefore has an incentive to help ensure that it is realized. In addition, the benefit owner(s) should have sufficient influence to help bring about its realization.

- **For the solution alternatives considered, have the linkages between each business benefit and enabling activities and considerations—spanning governance, BPR, OCM, and IT acquisition—been identified? Are these enabling activities accounted for in cost, schedule, and risk analyses?**

As explained in Chapter Two under "Conditions for Success . . . Linkage of Benefits to Enabling Activities and Considerations," delivery of business benefits entails a set of enabling activities and considerations that span governance, BPR, OCM, and IT acquisition. These activities and considerations are addressed in Chapters Three through Six, and in the questionnaires in the subsequent sections of this appendix. Linking activities with benefits is critical because it provides the foundation for their inclusion in cost, schedule, and risk analyses in the business case, thereby supporting the justification for the selected course of action. Such links also provide the foundation for managing the process to realize benefits. While explicit linkages to individual benefits may not be present in the business case, supporting analyses describing the linkages should be made available to the analyst.

- **Has the preferred alternative been selected according to an analysis of business benefits that are tied to (prioritized) enterprise business goals, in view of cost, schedule, and risk?**

As noted in Chapter Two under "Conditions for Success . . . Comprehensive Analysis of Alternatives," once the set of alternatives has been established, the basis for selecting the preferred alternative should be an assessment of the business value offered by each in view of the associated cost, schedule, and risk. As explained earlier, characterizing the full range of business benefits offered by each alternative should be attempted. Similarly, the full range of costs, schedule drivers, and risks should be captured. Often, the benefits and risks for alternatives may be dissimilar in kind, which requires a decisionmaker to employ judgment in prioritizing benefits and risks. This informed judgment is preferable to assuming away any important differences in benefits and risk, or employing a methodology that does not adequately capture enterprise priorities.

Governance

See Chapter Three for a more thorough discussion of governance considerations.

- **How do the decisionmaking criteria support the strategy and business case and associated benefits realization?**

As described in "Conditions for Success" in Chapter Three, the decisionmaking criteria used within the governance process should be grounded in the well-articulated business case (addressed in the previous section). This business case has documented objectives and desired benefits, therefore all decisions need to be made in the context of achieving these objectives and benefits.

- **How has the governance structure been optimized to maximize decisionmaking effectiveness and efficiency?**

The following are some considerations for an optimized governance structure:
  - Authority is documented and supported by statute, regulation, policy, or official correspondence. The scope of decisionmaking authority is well defined, and recourse for areas outside this authority is established.

- What are members' roles and responsibilities? Are they documented in an enforceable charter?
- Who is the ultimate decisionmaker and what is his/her tenure?
- If decisionmaking is done by committee, what is the process for reaching decisions in a timely manner that will move the activity forward without hindering achievement of the objectives and benefits outlined in the business case?
- If the governance structure contains multiple layers, what is the justification for those layers (e.g., dictated by laws, regulations, and policies)? If dictated by regulations or policies, can they be waived to streamline the structure? As described under "Challenges" in Chapter Three, cross-functional governance structure can filter, dilute, or otherwise change information. This potentially delays critical decisions or even results in the wrong problem being addressed. Regardless, either case could adversely affect cost, schedule, and benefits realization.

Business Process Reengineering

As the body of this report states, the most critical challenge to overall BPR project success is not technical; rather, it involves the human and behavioral aspects of OCM (Somers and Nelson, 2001). See Chapter Four for a more detailed discussion of key BPR considerations, such as leadership support and organizational and incentive structures.

- **Does the BPR activity have visible senior leadership support?**
- **Have the goals and objectives of the BPR activity been communicated by senior leadership?**

Even when a particular BPR activity is taking place to support a technological implementation, this communication should originate from functional, not acquisition, leadership.

- **Do BPR teams consist of members representing each function to be affected by the process changes?**

Team members should be knowledgeable enough to be able to speak authoritatively on behalf of the functional community, and should be empowered to make decisions affecting the processes of their functional community.

- **Do senior leadership, middle management, and support staff have sufficient knowledge of BPR?**
  - Has leadership set realistic expectations for BPR activity?
  - Are there individuals available to the project team with an understanding of business processes at an enterprise and program level?
  - Are there individuals available to the project team with knowledge of BPR methodology and practice?
- **Were the AS-IS and TO-BE processes mapped before technology selection? Are they aligned with the DoD and Air Force business process architectures?**

These process maps should be included in the BPR Assessment Package. The processes should be mapped in sufficient detail to identify root causes of process problems in the AS-IS environment and the corresponding solutions in the TO-BE processes.

- **Is a plan in place to use metrics to manage/measure process improvements?**

Note that process improvements are different from technical improvements.

- **Are there mechanisms and processes in place to minimize unnecessary customization?**

Significant customization should be justified by a business case demonstrating enterprise-level cost-benefit analysis approved by the executive steering committee (or project sponsor).

Organizational Change Management

See Chapter Five for a more detailed discussion of key OCM considerations.

- **Have resources been identified? Are they adequate to cover the following activities?**
    – Stakeholder analysis
    – Communications plans
    – Training
    – Education

- **Are OCM activities predominantly 'owned' by the FMO?**

It is typical for some OCM activities to be contracted out. However, if a support contractor is employed to perform OCM activities, the contract should be managed and overseen by the FMO. In general, OCM activities should ultimately be performed by the functional community.

- **Was a thorough stakeholder analysis done before finalization of the business case, before program initiation?**
    – Are all stakeholders (external and internal) included in the analysis?
    – Have the priorities and equities of each stakeholder been identified?
    – Does the analysis consider actual levels of commitment, attitudes, or beliefs of each stakeholder? Some level of awareness of commitment and attitudes is necessary to anticipate "sticking points" in the project/initiative.
    – Are resources in place to update the stakeholder analysis when appropriate (in response to key decisions that change the trajectory of the effort)?
    – Have the stakeholder analysis and organizational constraints been considered when finalizing the business case (particularly when determining feasibility of and strategy for achieving desired benefits)? If not, feasibility of realizing desired benefits should be reexamined.

- **Have leadership, decision groups, and boards been adequately educated on the nature of the transformation and, if necessary, on the IT system to be adopted and the preparatory activities to be carried out? If not, are there plans and resources in place to provide such education?**

Leadership should understand potential pitfalls and best practices. Involvement may need to be more intense than expected; this activity should help leadership understand where and why their support and time is needed.

- **Are resources and executable plans in place for dealing with or incentivizing unwilling parties?**

It is difficult to predict the extent of possible resistance, but plans should not simply assume compliance from all communities and should make use of stakeholder analysis to better anticipate and plan for resistance. Successful strategies for mitigating resistance could include the following options:
  - promotion opportunities
  - performance reviews
  - development and emphasis on new roles and responsibilities.

- **Is the communications plan well planned, with adequate resources?**

  - Are multiple vehicles to be used in communications? (Examples may include informational websites, webinars, staff meetings, high-visibility announcements and editorials by leadership, Q&A sessions, fact sheets)
  - Does the communications plan allow for feedback from anyone in the affected community?
  - Is the message in the communications plan consistent with the organization's values and the overall objectives of the initiative?
  - Are resources adequate for this production and dissemination? (Oftentimes, contractors will aid in the development of materials, but the government is responsible for production and dissemination.)

- **Do education and training plans address all of the following:**

  - training and orientation for those involved in transformative efforts *before* the onset of these efforts (e.g. BPR, data quality improvement)
  - training for new processes to be implemented following BPR activities (if necessary) and system deployment
  - appropriate professional development for individuals who will need new skills and knowledge to perform new processes or duties
  - technology and system training for use of the system's functionalities.

IT Acquisition

The information contained in this IT acquisition questionnaire is intended to direct the reader to potential areas of risk bearing further examination. This is intended to be a synopsis of the information provided in Chapter Six.

- **Is the preferred alternative aligned with the DoD and Air Force target enterprise IT architectures?**
- **Were all IT options fairly evaluated before a particular solution was selected? This is typically contained in the AoA (see Chapter Six for criteria).**

- How closely ranked were the alternatives? Were there key assumptions that, if changed, would change the result? If so, are those assumptions still valid?

- **What functional and organizational boundaries will the system cross?**

    - Are senior functional officials representing all key stakeholders (and empowered to make decisions for their communities) assigned to the program team?
    - Are there conflicting goals or priorities among the key stakeholders? Are these likely to be resolved without disrupting program execution?

- **How complex is the functional domain?**

    - How structured/standardized are the processes to be automated? Processes common among other users of the software (e.g., general ledger) should require less tailoring and testing than highly variable processes (e.g., maintenance).
    - In how many similar applications has the chosen software been used? Was the functionality satisfactory? Was significant customization required?
    - How many similar applications has the implementing contractor developed and deployed? Is the expertise from prior projects guaranteed to be available for the current program (e.g., key personnel clauses, strong contractual incentives, etc.)?
    - Will the chosen system have all functionality required or will extensions or additional applications need to be developed or added to meet the system requirements (i.e., fit/gap analysis)? Have the requirements and feasibility of these extensions or additional software been analyzed and included in program budgets and schedules?

- **How many interfaces to external systems will be required?**

    - How complex are these interfaces? Are there documented interface specifications/agreements?
    - Are there planned changes or upgrades to these systems that might affect the current system design? Upgrades to external systems may require changes to the program of interest, delay testing, and possibly introduce concurrency risk.

- **Has the data quality of the legacy and trading partner systems been assessed?**

    - Is there a specific action plan for data cleansing (e.g., standardized data element definitions or formats, funded data cleansing effort by data owner or program office)?

- **What are the key limitations of the legacy system? This should be documented in business case.**

    - How will the new system address these limitations? (E.g., if the objective is auditability, will the new system and its data sources be compliant with audit standards? If not, have courses of action and their likely impact on cost and schedule been identified?)

- **Is the plan for phasing releases and increments logical and executable?**

    - Does it consider complexity, operational priorities (e.g., auditability, retirement of legacy systems), implementing basic functionality before extensions,

encompassing complete end-to-end processes where feasible, and coordinating with other related initiatives (e.g., reorganization, replacement or upgrades of legacy systems, changes in hosting environment)?

- − If there is overlap in key activities between releases, is sufficient qualified staff available to execute activities in parallel?

- **Are there personnel with relevant ERP implementation experience committed to work with the FMO and PMO on planning, implementation, and deployment? These may be government personnel experienced with BPR (for FMO) or ERP (for PMO) in other organizations, or trusted independent experts who can be used as advisers.**

References

Abdinnour-Helm, Sue, Mark L. Lengnick-Hall, and Cynthia A. Lengnick-Hall, "Pre-Implementation Attitudes and Organizational Readiness for Implementing an Enterprise Resource Planning System," *European Journal of Operational Research*, Vol. 146, No. 2, April 2003, pp. 258–273.

Abdolvand, Neda, Amir Albadvi, and Zahra Ferdowsi, "Assessing Readiness for Business Process Reengineering*," Business Process Management Journal*, Vol. 14, No. 4, 2008, pp. 497–511.

Al-Twairesh, Nora, and Abdullah S. Al-Mudimigh, "Business Cases for ERP Implementation," *Journal of Theoretical and Applied Information Technology*, Vol. 25, No. 1, March 15, 2001, pp. 43–49. As of August 8, 2012:
http://www.jatit.org/volumes/research-papers/Vol25No1/6Vol25No1.pdf

Bearing Point, *Implementing ERP Systems in the Public Sector: Nine Sure Ways to Fail—Or Succeed*, McLean, Va., 2004. As of May 7, 2013:
http://www.purdue.edu/onepurdue/about/documents/implementing_erp_public_000.pdf

Bliss, Gary, "PARCA Root Cause Analysis for Enterprise Resource Planning Systems," memorandum to Principal Deputy USD (AT&L), Washington, D.C., February 23, 2011.

Boudreau, Marie-Claude, and Daniel Robey, "Coping with Contradictions in Business Process Re-Engineering," *Information Technology and People,* Vol. 9, No. 4, 1996, pp. 40–57.

Capgemini Consulting and The Economist Intelligence Unit, *Trends in Business Transformation: Survey of European Executives,* April 2007. As of January 18, 2013:
http://www.capgemini.com/m/en/tl/Trends_in_Business_Transformation.pdf

Carey, Kevin L., and Elmer D. Valle, *Navy ERP Program: Governance Challenges in Deploying an Enterprise-Wide Information Technology System in the Department of the Navy*, Monterey, Calif.: Naval Postgraduate School, 2010.

Carter, Ashton B., USD (AT&L), "Directive-Type Memorandum (DTM) 11-009, Acquisition Policy for Defense Business Systems (DBS)," memorandum for Secretaries of the Military Departments, Chairman of the Joint Chiefs of Staff, Under Secretaries of Defense, Deputy Chief Management Officer, Assistant Secretaries of Defense, General Counsel of the Department of Defense, Director of the Operational Test and Evaluation, Director of the Cost Assessment and Program Evaluation, Inspector General of the Department of Defense, Assistants to the Secretary of Defense, Director of Administration and Management, Director of Net Assessment, Directors of the Defense Agencies, and Directors of the DoD Field Activities, Washington, D.C., June 23, 2011.

Chen, Yih-Chang, *Empirical Modeling for Participative Business Process Reengineering,* thesis, United Kingdom: University of Warwick, December 2001.

Davenport, Thomas H., *Mission Critical: Realizing the Promise of Enterprise Systems*, Cambridge, Mass.: Harvard Business School Press, 2000.

Davenport, Thomas H., and Donna Stoddard, "Reengineering: Business Change of Mythic Proportions," *MIS Quarterly,* Vol. 18, No. 2, June 1994, pp. 121–127.

Defense Business Board, *Task Group on a Culture of Savings: Implementing Behavior Change in DoD*, Report FY11-01, January 2011. As of August 21, 2012: http://dbb.defense.gov/pdf/FY11-01-A-Culture-of-Savings-Final-Report_B256.pdf

DoD—*See* U.S. Department of Defense.

Eckartz, Silja, Maya Daneva, Roel Wieringa, and Jos Van Hillegersberg, *Cross-Organizational ERP Management: How to Create a Successful Business Case?* Netherlands: University Twente, 2009.

Enterprise Integration Incorporated, *Public Sector Enterprise System Implementation: Understanding Private Sector Differences*, Alexandria: Enterprise Integration Inc., 2009, pp. 1–23.

Esteves, Jose, Joan Pastor, and Josep Casanovas, "Monitoring Business Process Redesign in ERP Implementation Projects," AMCIS 2002 proceedings, Paper 125, 2002.

Fernandez, Sergio, and Hal Rainey, "Managing Successful Organizational Change in the Public Sector," *Public Administration Review,* March/April 2006, pp. 168–176.

Finney, Sherry, and Martin Corbett, "ERP Implementation: A Compilation and Analysis of Critical Success Factors," *Business Process Management Journal*, Vol. 13, No. 3, 2007, pp. 329–347.

Frederickson, James W., "The Strategic Decision Process and Organizational Structure," *Academy of Management Review,* Vol. 11, No. 2, 1986, pp. 280–297.

GAO—*See* U.S. Government Accountability Office.

Gulledge, Thomas, and Ranier Sommer, "Public Sector Enterprise Resource Planning," *Industrial Management and Data Systems*, Vol. 103, No. 7, 2003, pp. 471–483.

Gunasekaran, A., E. W. T. Ngai, and R. E. McGaughey, "Information Technology and Systems Justification: A Review for Research and Applications," *European Journal of Operational Research*, Vol. 173, 2006, pp. 957–983.

Hammer, Michael, "What is Business Process Management?" in J. Vom Brocke and M. Rosemann, eds., *Handbook on Business Process Management,* London-New York: Springer-Verlag Berlin Heidelberg, 2010.

Hammer, Michael, "Reengineering Work: Don't Automate, Obliterate," *Harvard Business Review,* July-August 1990, pp. 104–112.

Hammer, Michael, and James Champy, *Reengineering the Corporation: A Manifesto for Business Revolution,* New York: HarperCollins Publishers Inc., 2003.

Inside the Air Force, "USAF Cancels ECSS, Long-Delayed System Meant to Modernize Logistics," 9 Nov 2012. As of 26 Nov 2012: http://insidedefense.com/201211082415673/Inside-Defense-Daily-News/DefenseAlert/usaf-cancels-ecss-long-delayed-system-meant-to-modernize-logistics/menu-id-61.html

Inspector General of the U.S. DoD, *Enterprise Resource Planning Systems Schedule Delays and Reengineering Weaknesses Increase Risks to DoD's Auditability Goals*, Washington, D.C., DODIG-2012-111, July 13, 2012.

Jarvis, Thomas G., *Leadership in Government Organization Change Efforts: A Multi-Case Analysis*, thesis, Monterey, Calif.: Naval Postgraduate School, 2004.

Kelman, Steven, *Unleashing Change: A Study of Organizational Renewal in Government,* Washington, D.C.: The Brookings Institution, 2005.

Kettinger, William, James Teng, and Subashish Guha, "Business Process Change: A Study of Methodologies, Techniques, and Tools," *MIS Quarterly,* Vol. 21, No. 1, March 1997, pp. 55–98.

Khan, Asif A., "DoD Financial Management: Reported Status of Department of Defense's Enterprise Resource Planning Systems," letter to congressmen P. "Buck" McKeon, Adam Smith, Michael Conaway, and Robert Andrews, Washington, D.C., March 30, 2012.

King, Cynthia, and Douglas Brook, *Effective Communication Practices during Organizational Transformation: A Benchmarking Study of the U.S. Automobile Industry and U.S. Naval Aviation Enterprise,* Monterey, Calif.: Center for Defense Management Reform Graduate School of Business and Public Policy, Naval Postgraduate School, July 2007.

Kirchmer, Matthias, "Business Process Change Management for ERP and other Public Sector Projects," in Rainier Sommer, *Public Sector Enterprise Resource Planning: Issues in Change Management*, Cheltenham, United Kingdom: Edward Elgar Publishing Limited, 2006.

KPMG LLP, *ERP and the Public Sector: Useful Implementation Insights from Peers That Have Been There, Done That*, Shared Services and Outsourcing Advisory—Public Sector, May 2011.

Lew, J. L., "Chief Information Officer Authorities," memorandum for the Heads of Executive Departments and Agencies, Washington, D.C., August 8, 2011.

Lopez-Estrada, Micheline, "Challenges of Implementing Enterprise Resource Planning Applications within the Department of Defense," in Rainier Sommer, *Public Sector Enterprise Resource Planning: Issues in Change Management*, Cheltenham, United Kingdom: Edward Elgar Publishing Limited, 2006.

Love, Peter E. D., Zahir Irani, Craig Standing, Chad Lin, and Janice M. Burn, "The Enigma of Evaluation: Benefits, Costs, and Risks of IT in Australian Small-Medium-Sized Enterprises," *Information and Management,* Vol. 42, 2005, pp. 947–964.

Mercken, Roger, "IT Investment Decisions: Value, Uncertainty, and Gut Feeling," *Journal of Economics and Management,* Vol. L, No. 4, 2005.

Michael, Gavin, Jim Astorian, and Mark Willford, "Why Big Systems are Here to Stay," *Accenture Outlook*, March 2012. As of August 21, 2012: http://www.accenture.com/us-en/outlook/pages/outlook-journal-2012-why-big-systems-are-here-to-stay.aspx

Minonne, Clemente, and Geoff Turner, "Business Process Management—Are You Ready for the Future?" *Knowledge and Process Management: The Journal of Corporate Transformation*, May 8, 2012.

Murphy, Kenneth E., and Steven John Simon, "Intangible Benefits Valuation in ERP Projects," *Information Systems Journal*, Vol. 12, 2002, pp. 301–320.

Muthu, Subramanian, Larry Whitman, and S. Hossein Cheraghi, "Business Process Reengineering: A Consolidated Methodology," in *Proceedings of the 4th Annual International Conference on Industrial Engineering Theory, Applications, and Practice*, San Antonio, Texas, November 17–20, 1999.

Nafeeseh, Rana Abu, and Abdullah S. Al-Mudimigh, "Justifying ERP Investment: The Role and Impacts of Business Case: A Literature Survey," *IJCSNS International Journal of Computer Science and Network Security,* Vol. 11, No. 1, January 2011.

Nah, F., and S. Delgado, "Critical Success Factors for ERP Implementation and Upgrade," *Journal of Computer Information Systems,* Vol. 45, No. 5, October 2006, pp. 99–113.

Navy Enterprise Resource Planning (ERP) Program, "Brief for DLA Finance Process Review Committee Meeting," November 2009.

Oliver, Dave, and Celia Romm, "Justifying Enterprise Resource Planning Adoption," *Journal of Information Technology*, Vol. 17, 2002, pp. 199–213.

Ostroff, Frank, "Change Management in Government," *Harvard Business Review*: Dow Jones Reuters Business Interactive LLC, May 1, 2006.

Panorama Consulting Group, *2010 ERP Report: Organizational Change Management*, Denver, Colorado: Panorama Consulting Group, 2010. As of April 12, 2013: http://panorama-consulting.com/resource-center/2010-organizational-change-management-report/

Phelan, Pat, *Toolkit: Focus on Five Key Areas for Better ERP Implementations*, Gartner Incorporated, G00152415, October 9, 2007.

Poti, Sapna, and T. J. Kamalanabhan, "Evaluation and Importance of a Pre-Change State in an Enterprise Resource Planning (ERP) Implementation Perspective in India: A Conceptual Framework," *Journal of Transnational Management*, Vol. 14, No. 3, 2009, pp. 241–256.

Public Law 99-433, Management of the Department of Defense Information Enterprise, Goldwater-Nichols, Department of Defense Reorganization Act of 1986 and Annual National Defense Authorization Act (NDAA), October 1, 1986.

Public Law 104-106, Clinger Cohen Act, February 10, 1996.

Public Law 111-84, Subtitle A, Audit Readiness of Financial Statements of the Department of Defense, Sec. 1003, National Defense Authorization Act for Fiscal Year 2010, October 28, 2009.

Reijers, H. A., and S. L. Mansar, *"Best Practices in Business Process Redesign: An Overview and Qualitative Evaluation of Successful Redesign Heuristics,"* International Journal of Management Science: Omega Vol. 33, 2005, pp. 283–306.

Russell, Robert, "Change Management in the Canadian Forces: Land Force Atlantic Area Headquarters," in Rainier Sommer, *Public Sector Enterprise Resource Planning: Issues in Change Management*, Cheltenham, United Kingdom: Edward Elgar Publishing Limited, 2006.

Sarker, Suprateek, and Allen Lee, "Using a Case Study to Test the Role of Three Key Social Enablers in ERP Implementation," *Information and Management*, Vol. 40, 2003, pp. 813–829.

Shang, Shari, and Peter B. Seddon, "Assessing and Managing the Benefits of Enterprise Systems: The Business Manager's Perspective," *Information Systems Journal*, Vol. 12, 2002, pp. 271–299.

Soh, Christina, and Siew Kien Sia, "The Challenges of Implementing "Vanilla" Versions of Enterprise Systems," *MIS Quarterly Executive,* Vol. 4, No. 3, September 2005, pp. 373–384.

Somers, Toni, and Klara Nelson, "The Impact of Critical Success Factors Across the Stages of Enterprise Resource Planning Implementation," in *Proceedings of the 34th Hawaii International Conference on System Sciences*, Maui, Hawaii, 2001.

Sommer, Rainer, "Public Sector Change Management: What are the ERP Issues?" in Rainier Sommer, *Public Sector Enterprise Resource Planning: Issues in Change Management*, Cheltenham, United Kingdom: Edward Elgar Publishing Limited, 2006.

Sommer, Rainer, "Public Sector ERP Implementation: Successfully Engaging Middle-Management," *Communications of the IBIMA*, Vol. 2011, Article ID 1624392011. As of August 21, 2012:
http://www.ibimapublishing.com/journals/CIBIMA/2011/162439/a162439.html

Staehr, Lorraine, "Understanding the Role of Managerial Agency in Achieving Business Benefits from ERP Systems," *Information Systems Journal*, Vol. 20, 2010, pp. 213–238.

Stoica, Mihail, Nimit Chawat, and Namchul Shin, "An Investigation of the Methodologies of Business Process Reengineering," in *Proceedings of Information Systems Education Conference*, 2003.

Strachan, Elise V., *Governance Structure Transformation During ERP Implementation*, Wright-Patterson Air Force Base, Ohio: Air Force Institute of Technology, 2008.

U.S. Air Force, *Air Force Instruction 16-501: Control and Documentation of Air Force Programs,* August 2006.

———, *Headquarters Department of the Air Force Organization Chart*, AFVA 38-104, January 17, 2011a. As of April 12, 2013:
http://static.e-publishing.af.mil/production/1/af_a1/publication/afva38-104/afva38-104.pdf

———, *Air Force Instruction 33-401: Air Force Architecting,* May 2011b.

———, *DEAMS Governance and Structure*, Defense Enterprise Accounting Management System (DEAMS) Program Management Office (PMO), March 22, 2012.

U.S. Code, Title 10, Section 2224, Defense Information Assurance Program, 2006.

U.S. Department of Defense, *The Defense Acquisition System,* DoDD 5000.01, October 23, 2000.

———, *Operation of the Defense Acquisition System*, DoDI 5000.02, December 8, 2008.

———, *Management of the Department of Defense Information Enterprise*, DoDD 8000.01, February 10, 2009.

———, *Guidance for the Implementation of Section 1072: Business Process Reengineering,* DCMO, April 30, 2011.

———, *Business Case Template V3.0 (May 2012) Instructions,* DCMO, May 2012a.

———, *Defense Acquisition Guidebook,* Defense Acquisition University, December 2012b.

U.S. General Accounting Office, *Business Process Reengineering Assessment Guide*, Version 3, Accounting and Information Management Division, Washington, D.C., GAO/AIMD-10.1.15, May 1997.

U.S. Government Accountability Office, *DOD Business Transformation: Air Force's Current Approach Increases Risk that Asset Visibility Goals and Transformation Priorities Will Not Be Achieved,* report to the Subcommittee on Readiness and Management Support, Committee on Armed Services, U.S. Senate, Washington, D.C., GAO-08-866, August 2008.

———, *DOD Business Transformation: Improved Management Oversight of Business System Modernization Efforts Needed,* report to congressional requesters, Washington, D.C., GAO-11-53, October 2010.

———, *Organizational Transformation: Military Departments Can Improve Their Enterprise Architecture Programs,* report to the Committee on Armed Services, U.S. Senate, Washington, D.C., GAO-11-902, September 2011.

———, *DOD Financial Management: Implementation Weaknesses in Army and Air Force Business Systems Could Jeopardize DOD's Auditability Goals,* report to congressional requesters, Washington, D.C., GAO-12-134, February 2012.

U.S. Office of Management and Budget Circular No. A-130 Revised, (Transmittal Memorandum No. 4), "Management of Federal Information Resources," memorandum for heads of executive departments and agencies, Washington, D.C. April 13, 2012.

Under Secretary of the Air Force, *HAF Mission Directive 1-2,* May 2012.

Vogels, Werner, "A Conversation with Werner Vogels: Learning from the Amazon Technology Platform," interview with Jim Gray, *ACM Queue,* May 2006, pp. 14–22.

Wagner, William and Y. L. Antonucci, "An Analysis of the Imagine PA Public Sector ERP Project," *Proceedings of the 37th Hawaii International Conference on System Sciences*, 2004.

Ward, John, and Elizabeth Daniel, *Benefits Management: Delivering Value from IS and IT Investments*, London: John Wiley & Sons Ltd., 2006.

Wenrich, Kristi, and Norita Ahmad, "Lessons Learned During a Decade of ERP Experience: A Case Study," *International Journal of Enterprise Information Systems (IJEIS),* Vol. 5, No. 1, 2009, pp. 55–73.

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